AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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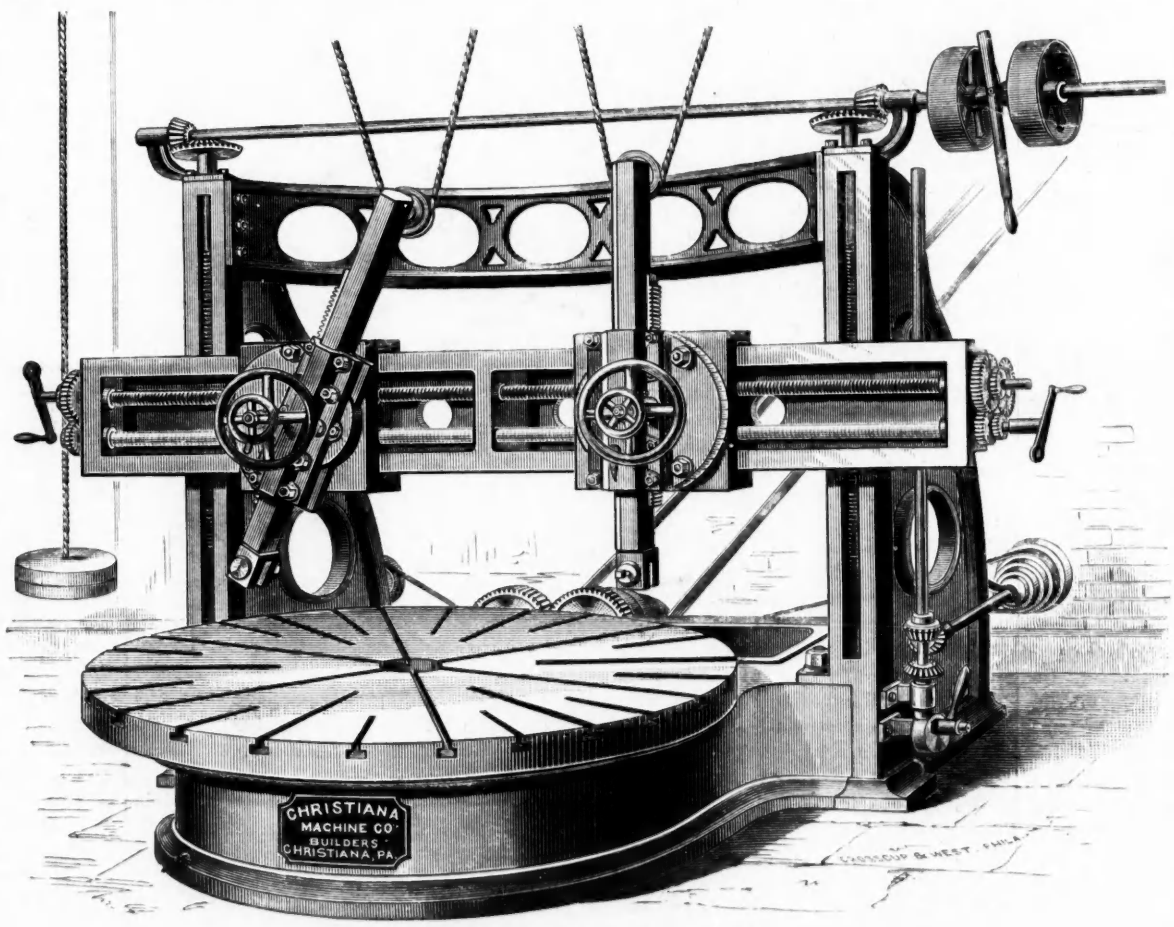
New Boring and Turning Mill.

In the machine represented by the engraving on this page, the bed or main casting, as will be seen, is made in the best form to insure strength, besides being well braced. It has a capacity for work 8 feet 3 inches in diameter, and 4 feet 6 inches high. The face plate is six feet in diameter, is very heavy, and turns on a center shaft 10 inches in diameter, 4 feet long, having a long, heavy babbitted box and steel toe and step. By a neat device it may be conveniently lifted off its annular bearing. In work like boring pulleys, or turning small pieces, specially advantageous. All the driving shafts are of steel, and motion is communicated from them to the face plate by internal spur gearing. The heavy cross bar is raised and lowered by power, and has two heads working automatically and independently in all directions, each being provided with a separate set of feed gearing, and having a convenient arrangement for reversing motion. The feed, which varies from $\frac{1}{16}$ inch to $\frac{5}{8}$ inch, can be changed instantly. The tool slides, which are hexagonal, are forged wrought iron, with wrought iron-cut racks, and steel pinions. They have 30-inch traverse, with rapid hand motion, and are counterbalanced. The cast steel tool holders are fitted to slides with taper and key, and admit of tools being turned in any desired direction. They are readily taken out and boring bars substituted, of which two are furnished with each mill. The general finish of the machine is in accordance with the best shop practice. The wearing surfaces are all scraped, nuts and other small parts case hardened, and the back gearing (which is large and heavy) cut from the solid. The cones have five changes for a four-inch belt, which, with gearing, gives ten changes on the face plate.



NEW BORING AND TURNING MILL.

The machine weighs about 22,000 pounds. It is built by the Christiana Machine Company, Christiana, Pa.

The Colorado Pacific Railway Co., has been incorporated at Pueblo, Col.

A joint stock company has been formed to supply Orange, N. J., with water. The city has 30,000 inhabitants, and no water supply, except from wells and cisterns.

The Central City, Deadwood and Eastern Railroad Company, has let the contract for building its road to Archibald McArthur, of Chicago. The line is to connect Central City and Deadwood, in the Black Hills, with the coal mines among the foot hills of that region.

The Value of the Study of the Mechanical Theory of Heat.

BY ALFRED R. WOLFF.

A PAPER READ BEFORE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

In presenting a few remarks on the value of the study of the mechanical theory of heat, I am imbued with the knowledge of two facts: of the importance and value of the study on the one hand, and of, in general, a lack of proper appreciation among engineers of this point on the other. There are doubtless few among educated engineers who would not admit that the acquisition of any form of knowledge is of value, not only as a training of the mind, but as an addition to our understanding of the laws and working of the universe and mankind; few who would deny that the study of literature, of social or politico-economic sciences would be of benefit to them, though of limited influence in the practice of their profession.

From personal experience, as well as from the experience of others, I am led to believe that engineers, as a class, look upon the knowledge of the mechanical theory of heat not much unlike that of the department of "belles-lettres," as possibly adding to refinement, to a broader view of things in general, to a fair drilling of the mind, but of no practical, or only slight practical, value in the ordinary, or even extraordinary, exercise of their profession. I am not prepared to say that, were the grounds above enumerated, the only ones upon which the study could be urged, that a strong argument in favor of its more general introduction could not justly be maintained; but this question does not arise since the more general introduction of the science can be presented to the engineer on the ground of direct, practical utility, for the purposes of correctly appreciating and increasing the efficiency of a large department of his profession, that department which treats of the transformation of the latent or active forces or powers of nature into a form suitable for application as motive power for utilization in machinery designed to do the desired special work, or, in other words, to that department which relates to the generation of the working fluid or motive power, and the work performed by the medium of such fluids in prime movers. It is on this ground that I would urge the more general acquisition of the science of thermo-dynamics, and to insure conciseness as well as a ready conception of my views, I will only briefly outline the thoughts, giving, as it were, their direction, and leave it to you to give them force—that is, to develop them more fully as your own understanding and experience will best suggest.

Thermo-dynamics, or the mechanical theory of heat, is, as the name implies, the science of the laws of heat, considered as a form of energy. It is based upon two great general laws, the one that all forms of energy are mutually convertible in certain exact, invariable equivalents, the other that the quantity of energy in a homogeneous substance is equal to the sum of the energy of its component parts, and that equal parts of a homogeneous substance, when undergoing a change of, or exerting energy, undergo like changes, and exert like effects. The application of these two fundamental laws of energetics to heat constitute the determination of the two general laws of thermo-dynamics, which are the basis of the whole science, and of which the science is in fact but an extension and application to forms of heat energy, latent or active, met with in nature and valuable in practice. For, after all, what is theory, but practice reduced to a connected system of laws or principles. Without facts, without phenomena, in short, without practice as a foundation, how could theory ever be conceived or established? In ordinary discussion but little attention is paid to the distinction between theory and hypothesis, and nothing has proved more disastrous to a general appreciation of theory than the repeated misuse of the term. Theory is based on facts, hypothesis on speculation; hypothesis changes to theory when speculation changes to facts. The two special laws of thermo-dynamics, upon which the whole science is elaborated, to which we refer, are: that heat is convertible to other forms of energy in the relation of what is known as Joule's equivalent—that is, that one thermal unit (the quantity of heat required to raise one pound of water at 39.4° Fahr. one degree in temperature) is equal to the energy required to raise 772 pounds 1 foot, or that 772 pounds, falling 1 foot, will develop sufficient heat to raise 1 pound of water, at its greatest density, 1 degree. The second is that if the total actual heat of a homogeneous and uniformly hot body undergo a change or exert energy, equal parts of the body will undergo equal changes and exert like effects, the sum of the effects of the component parts being equal to the total effect. This law is more popularly identified in the form of Carnot's theorem, a special application to heat that $q-q_1$ or $\frac{T-T_1}{T}$ is the limit of efficiency of such engines, and that the test of a perfect engine is its reversibility. q, and T, represent, respectively, the quantity of heat and absolute temperature of the (any) fluid when leaving the generator, and q_1, and T_1, respectively, the quantity of heat and absolute temperature of the fluid when given off to the refrigerator, $q-q_1$, when entirely converted into useful work, causing the engine to become theoretically perfect.

The above outlines the foundation and framework of a great science. It is strong and simple, and in its strength and simplicity, beautiful. The structure and superstructure are equally strong, equally beautiful, but not, however, equally simple. If this were the case, there would be little need of the presentation of papers of this kind, for the great value of the science would be universally acknowledged. It is

a common experience that the mass of mankind primarily pronounce that which is difficult to attain as not worthy of attainment, primarily too often look upon those who have mastered the difficult with scornful or doubting eye, until the achievement of the difficulty by the few has brought forward such valuable results, such striking truths, so influences the ordinary experiences and our conception of facts in nature or in our professions, that the worthiness and value of the attainment can no longer be denied, and must be definitely accepted. That point has now undeniably been reached in thermo-dynamics, and the sooner we concede it the better. The sooner we admit that we must study and explore the science of heat energy in its higher form, the sooner will we advance in our profession and contribute to its progress. It will be my aim to recall a few of the practical applications in engineering of the principles which thermo-dynamics has established, and thus to give an illustration, or rather indication, of its value. But before doing so, to be strictly conscientious, I must refer to the difficulties to be met with in the study in its higher form. Prof. McCulloch says: "Any one acquainted with only the elements of analytical geometry, and of the fluxional calculus, should find no difficulty in understanding all it contains. In this country, however, scientific education, as well as classical, has unfortunately retrograded; and superficiality is the fashion of the day. Hence, some anxious for scientific knowledge, with the least labor and in the shortest time, imagine it might be well in scientific literature to dispense with the calculus. To them, no better advice can be given than to begin by studying it thoroughly, if they would reasonably hope ever to comprehend much which must otherwise be unintelligible."

These elements, however, must be firmly fixed in the mind, and thermo-dynamics may justly be considered a thorough test of such a knowledge. When beginning the study of the subject, I thought I had fairly mastered calculus; while engaged in its acquisition, I found I was a mere novice, and such, too, has been the experience of a few of my friends who have already progressed and done good work in the science. But let us not be deterred from the acquisition of a valuable subject because of its difficulty. This really incites a person to a hard effort, and the gratification which the mastering of an important point gives forms an incentive to further advance, which acts more potently than the repulsive part of the difficulty. Let us not accept the valuable principles reached without making at least an honest effort to follow the masters who have discovered them, and thus make the principles in reality our own. But if our comprehension and efforts will not permit us to do this, let us not cry down the methods by which they were attained, and let us study the principles themselves thoroughly.

There is a wonderful harmony in nature—without it all scientific research would be of no avail. There are certain great invariable laws, some determined and many more not yet conceived; but in our faith in and knowledge of the reliability of those laws exists the only safeguard of advance. This opens up that large realm of reasoning known as "by analogy," and enables us to determine thus, and by analysis, laws which are not directly determinable from our practical experiences, or observed phenomena. Heat, the observed and usually acknowledged primary physical source of energy (though gravitation might, on some good grounds, be selected as our present ultimatum) beautifully illustrates this harmony when considered as energy, and thus prescribes laws which are afterwards verified in practice, and to which practice conforms and becomes the embodiment of. This is the strongest plea which, it seems to me, can be urged for the careful study of the mechanical theory of heat, and we will attempt to point out some of the work which has been done in this respect, and leave it to your judgment to decide whether a science which has already accomplished so much is not capable, when many able minds are devoted to its study, of an application and extension which is, and will be, of incomprehensible value in the ordinary practice of the engineer, and which will greatly contribute to the advance of mechanical engineering.

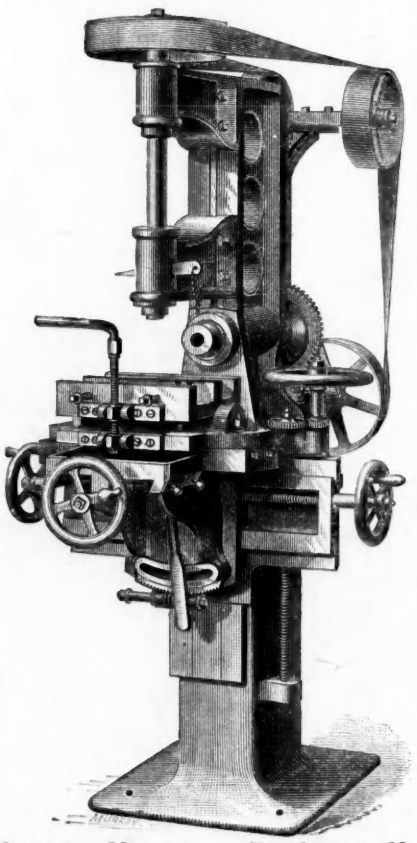
The specific heat at constant pressure of any permanent gas can be ascertained directly by experiment; not so the specific heat at constant volume. Regnault has made accurate determinations of the specific heat of such gases at constant pressure, and discovered certain laws relative to the same, that the specific heat of such a gas is independent of its temperature and density, and the product of the density and the specific heat is the same constant for all permanent gases. From the velocity of sound, independent of the principles of thermo-dynamics, the specific heat at constant volume for a permanent gas can be determined, and these two quantities when substituted in an equation of the theoretical value of the mechanical equivalent of heat, expressed as a function of the pressure, volume, dilatability, and the two specific heats of a permanent gas, give for this equivalent a theoretical value, which agrees with that practically determined by Joule, and recently verified by Professor Rowland. I need not dwell upon the mathematical exposition of this, but reference to Stewart ("Elementary Treatise on Heat," pages 330 & 412), Maxwell ("Theory of Heat," pages 169, 228, & 310), Cotterill, ("The Steam Engine Considered as a Heat Machine," page 82) and Rankine ("Steam Engine," page 321) will serve as a verification of the above summation. Permit me to call your attention to this remarkable agreement between theory and practice. The specific heat at constant volume is not directly determinable from experiment, so it is developed from the velocity of sound, and substituting these two independent experimental data (the two specific heats) in a theoretical equation not involving a previous determination of the mechanical equivalent of heat, we ascertain such equivalent from correct theoretical considerations, and it accords with the experimental determination. What a beautiful demonstration of the correlation of the different laws and facts of nature do we here perceive exemplified!

But this will appear rather as an illustration of the beauty and symmetry of the science than as a presentation of a fact of direct utility to the engineer in the practice of his profession, and since it is my special object to call attention to a few of the latter class of facts, I will have to omit the mention of the interesting relations between the physical properties of bodies, such as between the two elasticities and the two specific heats, gaseous viscosity and the molecular theory of the constitution of bodies—all of which the science teaches—and will at once refer to its main application for our own purposes, the work of fluids in engines. It is in this department of our profession that thermo-dynamics has made the deepest impression in practice, and is destined to continue it to a far greater extent. It has taught us the different laws of expansion and work of fluids, and has supplied us with the proper test of the efficiency of different forms of engines. $\frac{T-T_1}{T}$, the limit of efficiency, has enabled us to correctly appreciate the progress made, and to definitely point out the direction in which the advance in efficiency and perfection of heat engines lies. To increase the theoretical efficiency, T, the temperature of the fluid at its entrance to the cylinder should be raised, and T_1, the temperature at exhaust, lowered as much as possible.

The application of this principle to steam engines implies high steam pressures and great expansion. This was tried within certain limits, and the beneficial results looked for were not realized to the extent expected. The theory was still recognized as true by those who had grasped it, but the practical results had not conformed to their expectations. The nature, laws, and action of steam were thoroughly investigated, and it became apparent that condensation ensued, owing to heat consumed for internal work during expansion and to the detrimental action of the metal of the cylinder. When the steam enters the cylinder (of a lower temperature than the steam at its initial pressure) it gives out heat to the metal of the cylinder, and to do this sets free latent heat, causing water of condensation to be formed. When the steam in the cylinder expands, it performs internal as well as external work, and becomes partially liquefied; as the steam leaves the cylinder, rushing into the condenser, the water mixed with the steam evaporates, abstracting additional heat from the metal of the cylinder. When a fresh volume of steam of initial pressure now enters the cylinder, it comes in contact with the metal of lower temperature, water of condensation is formed, and the action continues as indicated above.

Several methods of decreasing this loss presented themselves:

1. The introduction of the compound engine, which, dividing up the range of temperature between admission and final exhaust, in two or more stages, causes less difference in each cylinder, and therefore



COMBINED MILLING AND DIE SINKING MACHINE.—SEE PAGE 3.

decreases the loss by condensation, while again the heat abstracted from the first cylinder at exhaust becomes available in the second cylinder.

2. The use of the steam jacket which tends to keep the metal of the cylinder at uniform temperature, and thus prevent the initial condensation of steam, and to supply heat to the steam in the cylinder to prevent condensation during expansion.

3. The introduction of a great number of strokes per minute, so that less time will be accorded to the steam to impart heat to the metal of the cylinder and to abstract heat during exhaust.

4. The use of superheated steam, since it can emit heat when being admitted to a cylinder of lower temperature, without causing water of condensation to form at entrance or during expansion.

Neither of the first three remedies proves entirely efficacious in practice, while all have greatly reduced the loss from condensation. An intelligent study of the theory of heat will show, however, that the latter is the only one which offers the possibility of entirely preventing condensation. Perhaps it will need some explanation why the steam jacket can never entirely prevent this loss. It is owing to the fact that the transfer of heat from the steam in the jacket is not as rapid as the transfer of heat from the internal sides of the cylinder to the steam in cylinder, that the steam on entering the cylinder heats up but a small thickness of metal to its own temperature, owing to the comparatively poor power of conduction of iron. And the steam in the jacket, similarly, heats up to its own temperature but a small thickness of the metal of the cylinder immediately in contact with it; in brief, the poor heat-conducting power of iron does not allow the transfer of heat from the steam in jacket to the steam in cylinder to be practically instantaneous.

There may be some who are opposed to the introduction of the high speed (as they are popularly termed) or rather "high revolution" engines. But whatever be their practical defects—and they possess some mechanical advantages that we are inclined to think more than counter balance those defects—the principle is in the right direction, and already splendid workmanship and refinement of mechanism and machinery tend to confirm the value theory accords the system.

We will now briefly refer to the use of air. Thermo-dynamics demonstrates its superiority to steam. Its permanently gaseous nature enables it to expand without doing internal work, and its temperature can be raised to a high degree without the objection of a high pressure difficult to control. But practically the few air engines built have as yet not proved a decided success, owing to the difficulty of obtaining a rapid convection of heat to and from the air employed, and the necessity of a larger cylinder than is needed for a steam engine of the same power. Again, very high temperatures of the air cause no inconsiderable strains due to irregular expansion of the metal and a slow oxidation of the metal as well. And so with other forms of fluid engines. Practical difficulties and obstacles have not always permitted the rigid teachings of thermo-dynamics to be precisely realized, though they have in most cases served as an exemplification of its truth. But as long as we have the laws of the mechanical theory of heat to teach us where the possibility of or road to progress lies, better steam and better air and better gas and better fluid engines will in time be built. Even with the fluids and materials at present known, the performance of engines is capable of being doubled, a result by no means too trivial to make an honest effort to master the principles which will aid us in securing this end. But who would dare to say in an age when Professor Crookes' fourth state of matter opens up realms of investigation undreamt of, and when Professor Bell's discovery of sound-transmitting rays of light potently reminds us that we are but at the threshold of our understanding of the laws of the universe, who would dare to say that new fluids, materials and conditions will not be discovered that will enable us to extend the limits of temperature between which the fluid can expand in a cylinder, and thus utilize by far the greater portion of the latent power which nature has presented to us in her stores of fuel!

But it may be said: The advances pointed out above in the efficiency of engines have not in all cases been instituted by those who have mastered the mechanical theory of heat, and the advances, therefore, are not in all cases the result of the study of the subject. This is partially true; that is, while, as far as I can learn, no advances have been secured in the efficiency of heat engines (not including, of course, reduction of friction and better mechanism for transforming the rectilinear motion of the piston) by men who have not been intimately acquainted with, at least, the fundamental principles of heat energy, they have not in all cases mastered the whole subject in its highest mathematical form. But to correctly appreciate and define the advance, the theory of heat energy has always been called into play, and if our progress in the efficiency of heat engines has not been as rapid as we might have desired, and is not as rapid at the present time as desirable, it is owing to a lack of knowledge and understanding of the subject under discussion by some of our more bril-

liant and experienced minds. There are two methods of gaining knowledge. One by acquiring the laws and results of the experience of others, the other by acquiring the laws by our own experience. Both constitute the acquisition of principles or theory. Both have their uses. But it is a loss of time, and it is at the expense of many failures and disappointments which do not contribute to real advance, if we arrive at the same principles by such failures that others have reached before us by whose experience we might have profited. When we have acquired the knowledge of the work that others have done, we are prepared to make further progress, and if the difficulties and obstacles multiply we will be fairly equipped and fully encouraged to meet them. If we then experience failures, they will contribute to real advance instead of demonstrating a fact or law which had already been acknowledged, and which it was within our power and province to know. Thus too will endorsement of, and investment of capital in, prime movers, advertised as realizing fabulous power, be avoided, since our knowledge of the laws of thermodynamics will have acquainted us with the principles of the conservation of energy, the impossibility of transgressing certain limits, and will, therefore, indicate or demonstrate the fallacies of the projected scheme.

In conclusion, I must say that I am aware that full justice has not been done to the theme under discussion, nor can, in my opinion, full justice be done to so grand a theme within the limits of a paper of this kind. A complete treatise would have to be written to demonstrate its true importance, and some work like that of Rankine is the best verification of the actual value of the science, and in its study does this value become most potently apparent.

But if I have been able to convince—say, one of you, heretofore uninterested, of the *vitality* of the study, I shall feel amply compensated, and will offer no apology for my enthusiasm in the cause.

Pattern Making—How to Select Wood for Patterns.

BY L. F. LYNE.

In selecting wood for fine and accurate patterns one of the first considerations is that it should be of the best quality, well seasoned and kiln-dried. If it is possible to procure timber which has been seasoned by the natural changes it is preferable, but such timber is hard to obtain, moreover the natural process consumes too much time.

In regard to the quality and kind of wood for patterns I desire to say that for general work pine is probably the best. There is a great difference in the quality of pine, which many proprietors of shops and manufactories do not seem to appreciate when purchasing material for patterns. It is very distressing, after a fine pattern has been completed, upon measuring it to find that the original dimensions have changed, the parts are warped, and after it has been used and laid in the pattern loft for awhile, and a second casting is made from it, the dimensions will be found to have changed still more, so as to cause much vexation in fitting up the casting. This necessitates the making of a new casting, and possibly a new pattern. I remember many instances of this kind.

Canada pine, for instance, is not good for fine patterns, but will warp, besides it is difficult to season. It is also of a hard, coarse and uneven grain. It is continually changing its shape with every variation in the temperature of the atmosphere. I have seen patterns made of the wood described, which after being finished were of such an unstable and distorted shape that they were thrown away before using and replaced by new patterns. A peculiar feature of this wood is that when a board is placed by the fire it will warp one way, but it cannot be drawn back to its original shape by turning the opposite side to the fire.

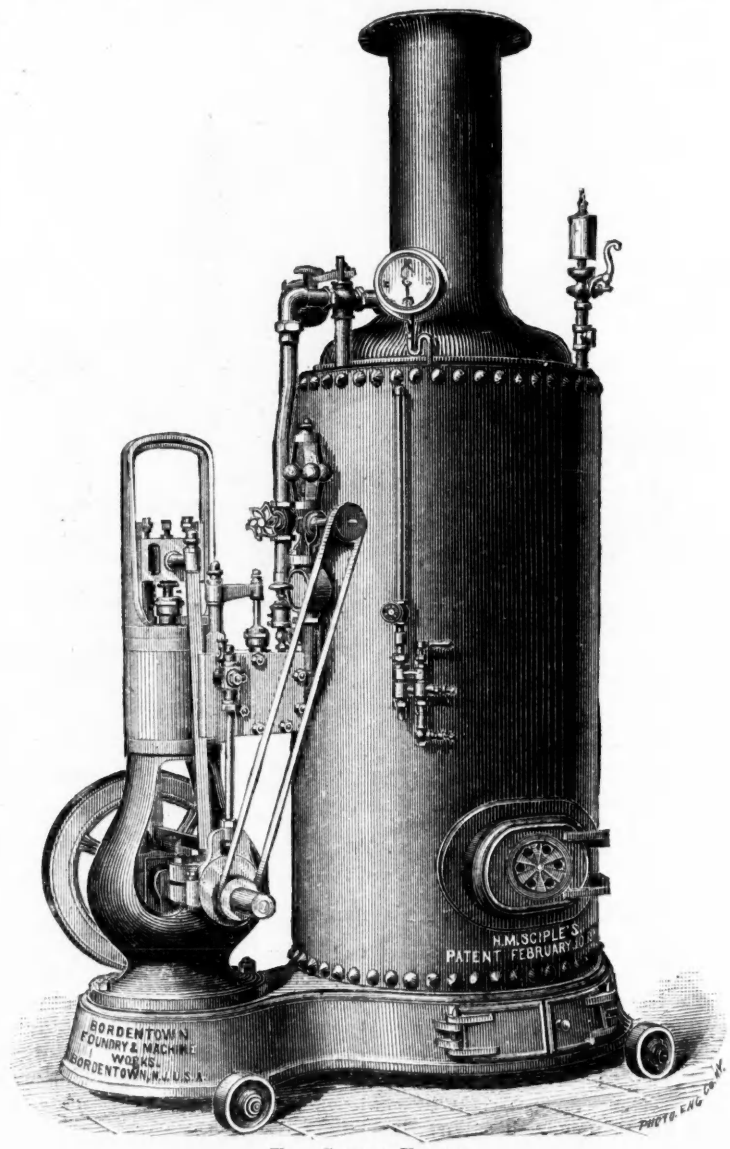
The pattern maker, in working this material, will encounter layers of a hard, pitchy substance, resembling glass, which fills the interstices or pores between the grain. This substance dulls the tools, and it is impossible to get a true surface unless the wood be very straight grained. In this case, by working between the grain, the pitch may be avoided, but in working across, or at an angle with the grain, the surface, when planed, will be found full of ridges. The best pine comes from Michigan. It is straight, close grained, and is free from pores and the inequalities alluded to. Before purchasing, each piece of timber should be carefully inspected, and if any checks are discovered, or if the wood is peculiarly heavy, these are indications that it is hard. The best timber does not check in seasoning, besides it is sound, light and close grained. It is also of an even degree of hardness, and may be easily worked, attended with a greatly reduced destruction of tools.

Michigan pine is generally of an even quality. An experienced pattern maker can readily detect imperfections in wood, and will select the best material; but the young and inexperienced workman had better test the material with his pocket knife, until experience will enable him to select good timber by inspection.

In order to season timber quickly and evenly, as well as to prevent warping, it should be set on edge, allowing about half an inch space between the pieces for a free circulation of air all about it.

The leading manufacturers, who have had an extended experience in the manufacture and use of patterns, make most of their large patterns of the best pine, as it is light, cheap, and retains its shape. It takes much less time to make patterns of good pine than of hard wood, and they are more easily handled. Small patterns, which are required for constant use and where close fits are required, should be made of hard wood. Mahogany is a good material for this purpose, and is probably more generally used than any other. For some special purposes, where mahogany cannot be used to advantage, cherry may be employed, but it should be of the best quality, well seasoned, as it is liable to change its shape. Mahogany, although a porous wood, is not readily affected by atmospheric changes. The best quality is brought from San Domingo; it is hard, very durable, and works better than some of the others. All wood to be used for patterns, should be straight-grained and free from knots. Uneven and hard-grained timber may be generally detected by its rough appearance. This is caused by the hard spots being elevated, while the softer places will be depressed. Lumber, where possible, should be placed on end, as in that position it is far less liable to get out of shape than in any other position. Before seasoning, wood should, if possible, be planed upon both sides, as it will season much quicker. If a board be planed only on one side, and laid upon the bench over night, it will warp. Some of the most experienced pattern makers, when leaving the shop, will set their material upon the edge, which prevents warping to a great degree, particularly if the shop be warm. It is impossible to season wood to the extent that it will be unaffected by the atmosphere. I have seen a stick of soft pine, 6 ft. long, expand and contract to the extent of $\frac{9}{64}$ of an inch by accurate measurement, and yet there are hundreds of pattern makers who will assert that wood never shortens or lengthens with the grain.

It is a good plan to remove the outside of a piece of timber and allow it to remain in a warm atmosphere before using, to insure the removing of all moisture. This may be done while other work is progressing, and without the loss of extra time.



THE SCIPLE ENGINE.

The Sciple Engine.

The annexed engraving represents a new design of vertical steam engine and boiler, which are now being manufactured by L. P. Thompson, at the Bordentown Foundry and Machine Works, Bordentown, N. J. Some of the peculiarities of this engine are its simplicity and great strength. The pedestal column or frame, cylinder and steam chest, are cast in one piece, which admits of less iron being used than where they are farther apart. The guides being placed above instead of below the cylinder admits of shortening the length of the column, which makes the engine less top-heavy, and when running fast there is less tendency to vibrate. The guides are cast solid with the cylinder head and there is no tendency to get out of line. By placing the guides and cross head above the cylinder a long connecting rod is secured, which is over five times the length of the stroke; by this arrangement the wear-and-tear of the guides and other parts is greatly reduced on account of the small angularity of the connecting rod.

By thus reducing the friction more power may be developed with the same expenditure of steam. The steam chest is large, the ports well proportioned, causing the least possible loss from friction of the steam in contracted passages, or by back pressure in the exhaust. The line of steam is directly central throughout the engine.

The piston rod, valve stem, cross beam, connecting rod, and the other working parts, are of steel and the best gun metal. The boiler attached to this engine is of peculiar construction, and calculated to give the most economical results. As shown in the engraving, this engine and boiler may be quickly transported, and put in operation wherever power may be required. It is also furnished with all the modern appliances. The engines are detached from the boiler, and for use in steam yachts or propellers, have a link motion attached. It is desirable for this purpose, on account of the small floor space required. The 6″×6″ engine, for instance, complete as a yacht engine, weighs but 200 pounds, and occupies a floor space of 14″×14″. This size engine is claimed to resist the severest test of a ten horse power boiler, and driving a 33″-blade propeller wheel entirely submerged.

Combined Milling and Die-Sinking Machine.

This machine, for a general idea of which see engraving on opposite page, is designed for the tool room where dies for stamping and drop forgings are made. It is equally useful for fluting taps, reamers, etc.; in fact, any milling that ordinary machines will do. The holes in each spindle are of the same size and taper, and drills can be used in either, and holes drilled at any angle. The vise is so pivoted that beveled work can be done with a square or straight cutter. The machine is adjustable in every direction, and is so constructed that few cutters are needed. The machine is also very useful in making metal patterns.

This machine is made at the new shop of C. C. Newton, 2,341 & 2,343 Callowhill street, Philadelphia, Pa.

Newly Incorporated Massachusetts Companies.

The American Bolt Company, Lowell. James Minter, president; Robert H. Butcher, treasurer. Capital $200,000, in shares of $100 each; for the manufacture and sale of bolts, nuts, tools, machinery and other articles from iron, steel and other metals, or which may be partly composed of wood. December 23.

The Lowell Kniting Machinery Company, Lowell. Samuel R. Payson, president; William W. Manning, treasurer. Capital $25,000, in shares of $100 each; for the manufacturing and selling knitting machinery and other machinery and manufacturing and selling knit fabrics. December 28.

The Tenexine Company, Boston. Charles H. Brown, president; Thomas C. Dunn, treasurer. Capital $25,000, in shares of $100 each; for the manufacture and sale of cement and mucilage, to be known as Tenexine Cement and Tenexine Mucilage, together with other compounds of an adhesive nature. December 28.

The Brockton Street Railway Company, Brockton. Lewis Coleman, George F. Hall, Fred Guild, C. R. Ford, B. O. Caldwell, Chas. F. Porter, Ziba C. Keith, directors; Fred Nourse, clerk and treasurer. Capital $40,000, in shares of $100 each; to commence at corner of Clifton avenue and Main street, and to run north through main street to a point near E. H. Reynolds' shoe factory; length of road about four miles.

Appliances for Indicators.

In our last issue we gave a description with a cut of a new reductor for steam engine indicators. A more simple and less expensive form of the reductor is shown in the engraving on this page as attached to an indicator. They are offered to engineers in this style or disconnected if desired. But we would recommend that they be separated, as the strain required to work the reductor is thus taken from the indicator, which should in all cases be entirely free from all unnecessary strain and vibration. These remarks apply more directly to fast running. This reductor can also be attached either directly to the engine or any other convenient place. Three pulleys of different sizes accompany this reductor. It is very simple, compact, and is put up in a strong finished box, easily carried.

LETTERS FROM PRACTICAL MEN.

Power Required to Drive Wood-Working Machines.

Editor American Machinist:

I have been recently making some tests of the power required to drive various wood-working machines, and as I have many inquiries in regard to such matters—and there is really very little known about it—I send you the results of the tests, as follows:

	H. P.
1 Panel Planer, 22″ wide, 1 cutter, 4,266 revolutions per minute....	1.908
1 Grey & Wood's Planer, 22″, on light stuff, 1 cutter, 3,426 rev. per min.	2.114
1 Grey & Wood's Planer, on heavy timbers, 1 cutter, 3,798 rev. per minute.....	3.757
1 Mitchell & Ruggles, on boards, 2 cutters, 3,152 rev. per min.....	6.058
1 Tenoning machine, on sash and blinds, 1 cutter, 1885 rev. per min.	1.487
1 Mortising machine, on sash and blinds, chisel 488 blows per min..	0.709
1 3-foot band saw, on inch boards, 500 rev. per min.....	1.034
1 16-inch circular saw, on 2″ hard wood, 1,830 rev. per min.....	2 382
3 High-speed bobbin lathes.....	1.818
4 Bobbin reamers.....	1.616
1 Bobbin saw, squaring ends.....	0.701
1 Large lathe, turning 9″ oak columns	3.530
1 Buzz planer, on small work, 3,815 revolutions.....	1.206
1 Jig saw, on 1-inch boards, 750 strokes.....	0.366

This makes a lot of machines which I have never before tested, and the facts may be of interest to your readers.

SAMUEL WEBBER.

Manchester, N. H.

Couplings, Hangers and Boxes—Solid Gauges.

Editor American Machinist:

The couplings which I sketched in your issue of Dec. 18, I have used constantly for the last 12 years, and I have put them into all sorts of hands, and have yet to hear the first complaint. I noticed the other day a key in one of them on $1\frac{15}{16}$″ line, and asked why it was put in. The foreman told me that one length of shafting was about $\frac{1}{16}$″ smaller than the other, and the coupling got to "wringing" before they noticed it. I have just put up a shaft with these couplings and a self-oiling adjustable post hanger, and will give the AMERICAN MACHINIST working drawings of both coupling and hanger, also of the self-oiling loose pulley, which I am just commencing to use.

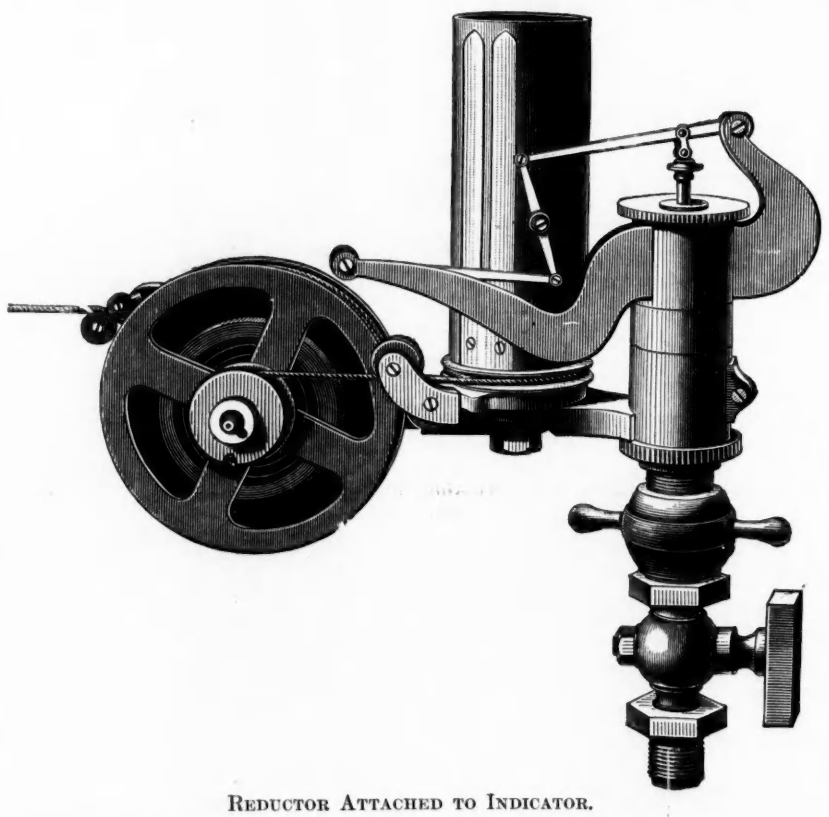
P. J., in his valuable article of Dec. 25, tells how he made a 96 foot length of $1\frac{15}{16}$″ shafting. According to my ideas P. J. employed the best method possible for a single job; no tool making, no fuss of any sort, and undoubtedly a good job when done. It is a cheerful thing to hear of a man in these days of 5,000ths who can go and do a job as the old timers could do it, and I may add, can get out as good a piece of work in the end as the heroes of the heel-tool, the hammer and chisel, file and straight edge sort produced regularly. I don't think, however, that a solid shaft is a desirable thing, and certainly would not order it for my own work; nor do I think that P. J. gave full enough details of his manner of boring a double taper in a block of cast iron.

It is not an easy matter to make the job of two tapers in a solid block, fitted with two cylinders with tapered ends, and have the cylinders run true where they enter the block, when the job is put together and put on the centers again. I should like to know just how P. J. made his double taper coupling. By boring on the saddle, or in the back-rest, or by putting a conical arbor on the nose of the lathe? The 2nd hole may be made pretty nearly true with the first, but I don't agree with Chordal at all when he says the double taper is the easy way to secure absolute concentricity. It takes very careful work with a file to make two shafts with tapered and pinned ends run perfectly true close to the coupling. I call upon Chordal right here to explain how the tit and socket make "an independent self-centering device" any more than the shoving of one shaft an inch into the coupling on the meeting length. Let him make it clear.

I will explain to Chordal why there should be no slack in coupling bolts: If there is any slack the bolts are sure to wear smaller, and the holes larger, if the shaft does hand-work and the coupling bolts are the usual size. In one shop which was blessed by my presence all couplings were fitted with a good sized V recess turned in the face of one flange, and a V tongue to fit turned on the other. These couplings were put up with bolts, "tapped lightly," and they did extremely well.

But the clamp coupling is by far the best and cheapest of any I know, and I am sure that those which Chordal and Prof. Sweet have had worriment with, were not well proportioned at first. In my own experience 1-64 difference in the size of the shafts joined by the same coupling makes no difference at all. I should think myself a very poor excuse for "head pusher" if I let a shaft go all over the shop for me. I will give, in my next, full details of construction for a line shaft with boxes warranted to run from Christmas to Christmas without attention. One shop, put up some 30 or 40 years since, had 130 feet of $2\frac{1}{2}$″ line shaft running in iron boxes filled with radial maple strips, so put in as to leave spaces next the box. Once a year this shaft was taken down, lined up, and oiled with sperm oil, and that settled it for the next twelve months.

This business of oiling-up certainly demands serious attention from line-shaft owners. Oil holes, gummed up with forty-cent oil-catchers (if that extravagance has been indulged in), running over full; a small boy with a big chew of tobacco and frightful profanity in his mouth, clad in a suit of denims that would run a small soap factory for a month; a ladder about twice as big as the boy can manage, covered with dirt and oil from one end to the other, and a big oil-can with a crooked nose, originally about two feet long, but now broken off to six inches and pounded up at the end, so as to deliver only about a quart of oil per minute. These are the essential features of line-shaft oiling in very many machine shops in this free and glorious country. In cold weather this small and greasy American citizen gets away from the boiler front about eight o'clock, with his ladder hung on one shoulder, and his big oiler full of boiling-hot oil in the other hand. As he enters the machine-shop door the end of the ladder batters the pattern maker, who is just going to the foundry with the hurry job, and knocks the pattern out of his hand, and sends him back to the pattern room to nail up his woodwork again; while the Casabianca of the big oiler sets up his ladder against the wall, hitches up his overalls, and proceeds to slobber half a pint of oil over the territory where tradition states the oil holes of the grindstone journals were at one time located. Of course these holes, in point of fact, were filled up in the Silurian age by a deposit of comminuted sandstone with ferruginous traces, and no oil has gone through them since. But as the grindstone sits in the dark corner next to the foundry this makes no difference at all, if the boy pours on oil enough, so that what runs over the ends of the journals gives sufficient lubrication. Space would fail were I to detail that boy's adventures, below and aloft, for the next three hours; how he doses the high silk hat of the shop's one good customer with about a gill of hot oil; how he insists on starting tools at his own pleasure, so as to get at the loose pulleys; how he fires an 8″ round shot of oil-soaked waste square into the face of the Dutchman on the driller, and then convinces him that "it dropped;" and how he lets a set screw in a collar bump the ladder against the Englishman who cuffed him the day before for hooking a string with a can of wash-bucket water at the end on the nose of the Englishman's lathe when he was threading short screws, so that the Englishman got a pint of dirty soap suds between his neck and his woolen comforter; and, finally, how, at eleven o'clock, having poured the last drop of oil in his two-quart can on the blanket of the terrier, belonging to the foreman's "best girl," who has called in for a chat, he returns to the engine room and deposits his empty oiler with a proud air of duty performed, and well performed at that. Were space ample, to what end would I detail the deeds of this oleaginous youth!



REDUCTOR ATTACHED TO INDICATOR.

I have never seen anything on the subject of shop gauges more solidly sensible than S. W. Goodyear's letter of Jan. 1. My own experience tallies precisely with his, and the happy intermediate between the two-foot rule and calipers, and the solid gauge is something well worth seeking. I have my own ideas on this subject, and should much like to know the experience and opinions of others as to this matter of adjustable gauges.

EASY WAY.

Use of Emery on Journals.

Editor American Machinist:

The article in a late issue, entitled "Fitting Up Journals," does not meet my views of the case. I never could consume two hours on a job by some tedious hand process when I felt sure I could do the same job in one hour by some heretical method.

During the last fifteen years I have had recourse to numerous expedients for trueing cylindrical bodies of iron and steel, and although I fear I shall, so to speak, cause the raising of many cudgels over my head, I am compelled to say that some kind of an abrasive process is necessary when *I* am to do a job of more than ordinary truth.

I dare say H. Norton would not expect the most expert hand with the scraper to produce the *surface*—to say nothing of the finish—required in a good telescopic speculum, yet the same can be brought to an almost mathematical degree of perfection by abrasive powders, regardless of the fact that a casting for a speculum must necessarily have spots of unequal hardness in its mass.

In advocating the use of emery and kindred substances for trueing journals, I would not have you believe that I recommend two pine sticks and a piece of old belting as the instrument with which to meet the case in hand. One excellent plan is to use a common clamp dog and two blocks of lead or soft alloy as grinders. The clamp dog is good for the reason that it is practically unyielding when tightened—an indispensable quality in a grinding clamp—and because it is short enough to be sensitive to jerks, caused by prominences on the shaft or journal.

I usually shape the bearing of the metal blocks so that they will partially encircle the shaft—each one say about one-third of the circumference—use some thin oil and speed the lathe as fast as it will run, without throwing the oil off from the surface of the shaft.

By careful manipulation, and the use of a *small* quantity of emery, I never fail to produce practically cylindrical journals or shafts. One condition of the work is to pass the grinding clamp from end to end of the shaft as rapidly as possible.

Cast iron requires more labor to finish it by grinding than wrought iron or steel, because one must remove a larger body of metal to get the surface entirely free from the porosity caused by tearing the surface in turning.

Unless one can grind away *all* of the particles that have been disturbed by the lathe tool, it is unsafe to use emery, as it is impossible to dislodge particles of it that find their way into the pores thus produced.

Chicago, Ill. C. C. HILL.

Case Hardening.

Editor American Machinist:

Having read, in your issue of January 1, 1881, a letter on the subject of case hardening, signed "W. S. Harris, Croton Falls, N. Y.," I, like he, "feel it my duty to speak," regardless of consequences.

The process of heating small articles of iron or decarbonized steel, to be case hardened, recommended by your correspondent, is often adopted with very satisfactory results, especially so if the work is light and the form is such that there is danger of changing the shape if packed and heated in animal carbon. Just here let me say a word about heating anything that is to be hardened when there is a liability of its changing shape or "springing." Nine out of ten tool fixers will tell you that the taps or

reamers sprung while in the water. Some of those men speak the truth, but the tenth man knows the mischief was done in the fire, and will prove it by permitting the tool to cool in the air and then putting it on centers. I hope the hint will be a sufficient excuse for my digression.

While fully agreeing with Mr. Harris that heating in a bath of salt and cyanide of "potash" is, in certain cases, a very good method, although expensive, I must say that his manner of cooling the articles to be hardened is certainly a novelty. He cools the bath at the same time, and in doing so loses his material, with the odds in favor of the destruction of his eyes. If he will take a piece of fine wire netting and bend it in the shape of a deep saucer, and suspend it by three or four wires brought together a little above the top of the crucible, he can put his work in this, suspend it in the bath until properly heated and then lift it out and plunge the work in water or oil, as the case may be, repeating the operation until all his work is hardened. This method is recommended as being more economical and convenient than that of Mr. Harris, but, as a rule, I prefer, for ordinary work, the process of case-hardening recommended by the AMERICAN MACHINIST in its answer to the communication of W. M., of Niles, Mich., December 18th.

PURE CARBON.

NEW YORK CITY.

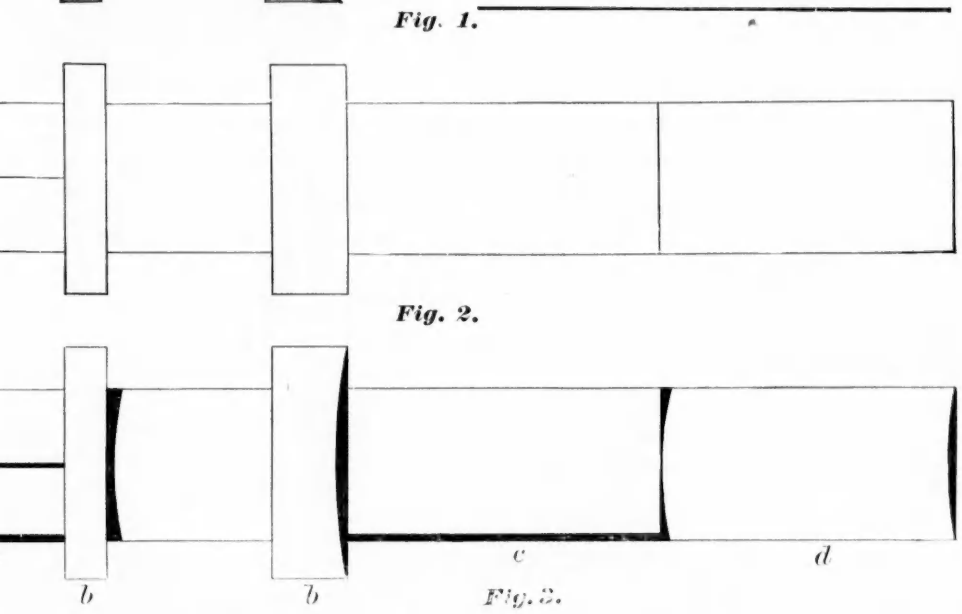
A New Condenser.

Editor American Machinist:

I send you for publication a condenser that draws its own injection water from a well, removes its air without an air pump, and possesses many novel features on a new principle, *unpatented*.

Some few years ago, when I commenced studying the action of steam in the steam engine, one of the first questions I asked myself was: "Why not pass the great body of steam (exhaust) into the air, or use it for other purposes, such as heating, etc., and then form the vacuum in the cylinder by the condensation of the remainder?" By such a plan very little water would be needed. The quantity used could be easily lifted by the vacuum formed, and the inertia of the body of steam as it flowed into the atmosphere would remove its own air. Dispensing as it would with air pumps, etc., it would place it in the reach as an economical adjunct, of small as well as large engines. Working upon these reflections I produced the drawings sent herewith. Although impracticable in detail as shown, the principles involved could be carried out, thus making a working condenser. The condenser consists of a cast iron body, which contains two chambers, *A* and *B*, connected with the exhaust pipes, *C* and *D*, with each end of the cylinder of the steam engine. The upper part of the chamber, *A'* and *B'* contains the water for condensation, which is supplied through the pipe *E*. The water flows through the valves *F*, into the lower chamber, A^2 and B^2, in finely divided streams, condensing the steam. Communication with the atmosphere is cut off by the valves, *G*. In slow-moving engines it could be made to work automatically; but with high speed engines it would be necessary to operate the valves by suitable mechanism, and connected with the engine, to insure the valves closing at the proper time.

In operation the *A'* and *B'* chamber is filled with water nearly to the top, so as to have a supply to start the condenser when the engine is set to work. The exhaust, as it rushes through the pipe from the cylinder, passes into the chamber A^2, opening the valve *G*, carrying out the water in A^2, and also the air in the cylinder. After the main body of the exhaust steam has passed through the condenser, the valve *G* is closed, the valve *F* is opened, and enough injection water passes into A^2 to condense the residue of the steam in the condenser and cylinder. As soon as the piston completes its stroke, when all communication is cut off from the cylinder to the condenser, the valve on the pipe *E* is opened and water flows in. It is drawn in by the vacuum in the pipes and chamber *A'*, to replace the water used in the former condensation of the exhaust. While this action is going on at one end of the cylinder, a similar action is taking place at the other end. Each end of the cylinder has its own condenser. The condenser should be placed next to the cylinder.



A NEW CONDENSER.

ISAAC H. DAVIS.

Dorchester, Mass.

Shading of Drawings.

Editor American Machinist:

Noticing "T Square's" article in your issue of December 4, 1880, in relation to pencil or crayon shading of mechanical drawings for the shop, has suggested to my mind the question as to whether "T Square" called up all the points at issue, when he simply made a comparison between Figures 1 and 2?

I think that no one will disagree with him in the advantages that Fig. 1 has over Fig. 2, in conveying to the ordinary mechanical mind (and most of our Western machinists are ordinary enough) the shapes that the drawing is meant to represent, and to designate which parts are square or cylindrical.

But I would offer Fig. 3 as a substitute for both (not for an instant claiming it as an original idea, for I saw the very same shade lines used on drawings nine years ago when I was an apprentice), and claim for its advantages: First, unmistakable evidence to which parts of any drawing are round or square. Secondly: ease of adding shade lines to a simple line drawing like Fig. 2. Thirdly: general prospective or "relief," into which parts so shaded are thrown; and lastly, but by no means least, in drawings for such large corporations as the Pennsylvania Railroad and our own (The Chicago, Burlington and Quincy Railroad), is the adaptation to such drawings and tracings for "blue printing."

T Square's crayon-shaded drawings would not be considered a success by any one who would attempt to blue print from a tracing so shaded (as I know to my sorrow), and I will vouch that any one trying to do so once will not care to repeat the experiment.

I would explain to those of your readers who may not have been accustomed to heavy shade-line drawings, like Fig. 3, that the bottom and right side lines of all square or angular objects are shaded, but not on round objects. As we always know that there is a reflected light on the under side of all cylinders, where two objects, one square and the other cylindrical, meet each other, as in the case of *c* and *d*, with their highest surfaces "flush," the shade line would diminish to an ordinary line at such point "substantially as shown" in the accompanying sketch.

Would be pleased to have friend T Square "talk back" if he is so inclined.

WM. O. WEBBER.

Chicago, Burlington and Quincy Test Laboratory, Aurora, Ill.

"Old Chip" Answers "Notes of a Foreman" and "A Foundryman."

Editor American Machinist:

For once, at least, our friend at Troy has found (in "A Foundryman's Hints") that some moulders do read, particularly such things as interest them. While no one need misunderstand him, his criticism and remarks on moulders are such as may lead to a great deal of perplexity. His experience with moulders must have been an exceptional one, perhaps such as would come from stove-plate moulders at work in a good general job foundry. I will say for the moulders that I have seen masters of their craft, men versed in the real sciences and requirements of moulding and the properties of pig irons, and that there are more good moulders than he would have us suppose. I would say, for the information of our friend at Troy, that there is no branch of business in general machine work that presents more difficulties than intelligent moulding, and yet the man (the moulder) who has to contend with these difficulties is invariably snubbed amongst mechanics and draughtsmen. He is never reasoned with; he is never consulted; notes are seldom compared with him, because nine out of ten mechanics or draughtsmen simply don't know enough of the requirements of moulding and melting iron to compare notes with him. Did our friend at Troy ever take the initiatory step toward organizing that Society for the Diffusion of Knowledge Among Moulders, by squarely trying for a half-hour to solve any of the difficulties about which he seems to know so much? Now for a few of the moulders' difficulties: A machinist knows that if he has to bore a pulley at Troy to $2\frac{7}{16}$", that it is precisely the same as if he has to bore a pulley $2\frac{7}{16}$" at Toledo, but the moulder, who has to make the pulley in *sand* at Toledo, is not sure that he can make as good a pulley as with the sand used at Troy. Gauges, $2\frac{7}{16}$", as made by Bodmer, Whitworth, Pratt & Whitney Co., or Betts Machine Co. are a great deal nearer alike, for their respective purpose, than the *sands* moulders have to use in various parts of the States. Again, machinists, pattern makers, and draughtsmen, in all parts of the country, know that the circumference of a circle is to the diameter as 3.1416 is to 1; but the moulder has no such positive rule that the pulley cast at Toledo will be the same in circumference as the one cast at Troy. Yet he has endeavored to mix his iron as near as is possible alike, both as to quantity and quality, and even taken out the molten iron from the cupola at precisely the same time, to insure the same quality of metal and the same temperature. The pulley at Toledo cracked in the arms, but was cast of as good iron, to all appearances, as the pulley at Troy. The pig-iron man had actually said the irons were both alike.

He knew that because he supplied them both. The irons were both pronounced positively "soft and strong," but the Toledo iron had the additional feature of being *shrinky*. Our friend at Troy may *see or feel* a difference of $\frac{1}{1000}$ between his work and his standard Whitworth gauge, but the moulder could neither *see* nor *feel* the sulphur or silicon, etc., that was in the pig-iron at Toledo and caused the cracking of the arms in the pulley.

Castings seem to take to themselves peculiar freaks of irregularities, the causes being

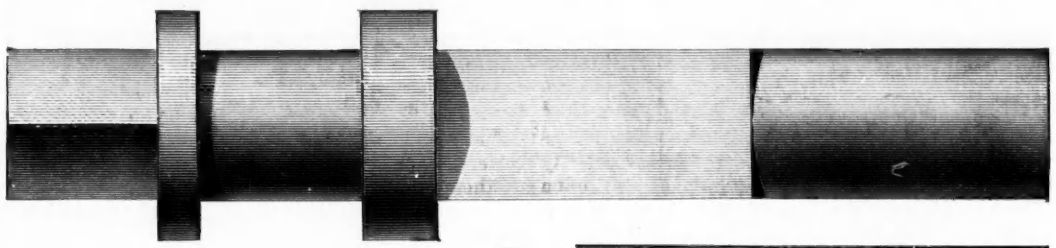


Fig. 1.

Fig. 2.

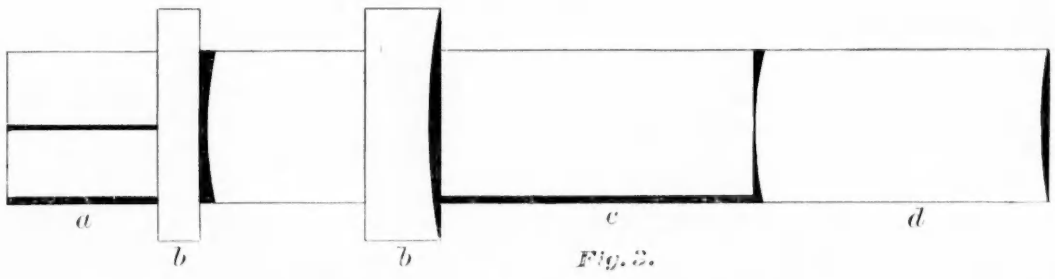


Fig. 3.

difficult to define. They occur sometimes in the sand, sometimes in the iron, sometimes in the cores, sometimes in ramming, sometimes in venting, and often with wrong facings. For instance, the quality of facing sand must always be graded, according to the casting to be made—*heavy or light, deep or shallow* in the mould. Again, inferior coal in facing sands is detrimental. Possibly the dealer in foundry facings has been grinding inferior stock, instead of getting a carbon in the form of coal dust to stand the iron pouring against the mould. There has been dirt and slate ground in with the coal. This is a cause of scabby castings, together with too fine a sand, or a sand without body, which all moulders dread except for very light work.

If moulders could only have good *sands*, good *irons*, and good *facings*, and the same stock supplied each time, there would be little need of complaint; but the geology of our country is not such as to admit of digging moulding sand at every foundry back door, when moulding sand costs from $40 to $50 a car delivered in a foundry yard, as I know it does in many instances. It becomes questionable whether a bad casting, occasionally, is not preferable to such expenses in sand. Other things being equal I aver that the moulders of this country in arranging, venting, coring, and making a mould, use more intelligence than most mechanics in running—or rather watching—a slide lathe.

Our friend at Troy somehow forgot to mention that some of the few good castings he occasionally got were spoiled in the machine shop by boring too large or turning too small, or the thing fell out of the lathe and got broken, or when "Black Satin" was trueing that $36''\times8''\times2\frac{7}{16}''$ pulley how he gave it a whack with the hammer, knocking the life out of it, by breaking two of its arms and causing its whole body to be cast into the fire.

Our friend, the foundryman, speaks of the tapped holes in his pattern not being prepared for the screws. This is not so bad as the machinist who put the draw holes on the wrong side of the pattern and when questioned about it, said he knew nothing about *draft* or *which side was up.* Draft or "moulder's glory," as it is sometimes called, is often withheld in the pattern shop when it would be a benefit to the moulder. and the work itself, to have it.

In answer to foundryman, I would say that, in pattern work, taper prints could just as well be used in drags as in copes. I used prints in this way, regularly eighteen years ago. It would be a good thing if generally adopted, but each shop, or each man in the shop, seems to have his own style of prints.

An excellent system instituted by the writer is to have all prints one inch in diameter and above one in thickness; all prints of one taper, one-quarter inch in one inch or one-fourth thickness in print. This will be found to be an excellent taper, for a core entering a print either in cope or drag. For prints of one inch diameter and less, my system makes their length the same as their diameter, which, with the constant angle of one in four, always makes the small end of the print just half its proper diameter, as the full size scale in the illustration will show.

The $\frac{3}{8}''$ pin is used on all prints three-quarters of an inch in diameter and upwards; the $\frac{1}{4}''$ pin is used for smaller diameters. All prints up to two inches diameter should be $\frac{1}{32}''$, and all prints above two inch diameter should be $\frac{1}{16}''$ larger than the core box, as dry-sand cores invariably increase in size, so that when dry they will not enter the core box they were made in. Pattern makers should make due allowance for this; particularly when dry-sand cores are to join or go into dry-sand cores, plenty of ease should be allowed.

A first-class pattern maker, with a good foundry experience, can do more to alleviate the moulder's troubles than any other man. The pattern maker—the observing, the knowing one—does not aim to make his patter n exact to dimensions with an eighth or tenth shrinkage rule, but puts his experience in with his dimensions, making a variable constant of his experience to suit the particular pattern in hand. Rapping of patterns, straining of the mould in casting, different kinds of iron, different thicknesses of castings, green sand, dry sand, or loam moulds, are all to be considered by the pattern maker in providing patterns to produce correct castings.

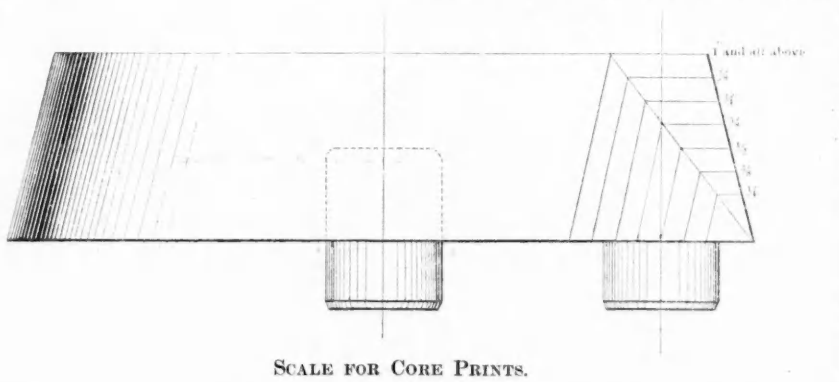
Many years ago I established the following shrinkage rules:

Patterns $\frac{1}{4}''$ thick and under,		$\frac{1}{8}''$	per foot.
" $\frac{5}{8}''$ thick to $1\frac{1}{4}''$ thick,		$\frac{1}{10}''$	" "
" $1\frac{1}{4}''$	" $1\frac{3}{8}''$	$\frac{1}{12}''$	" "
" $1\frac{3}{8}''$	" $2\frac{1}{2}''$	$\frac{1}{16}''$	" "
" above $2\frac{1}{2}''$		$\frac{1}{32}''$	" "
ordinary steam cylinders,		$\frac{1}{16}''$	" "

The above gives excellent results in general practice, but the difference in irons from different localities will even call for a modification of these rules. The knowing pattern maker will, however, provide himself with five different shrinkage rules, for different thicknesses of metal, as specified. If pattern makers would give this different-shrinkage question the necessary attention, moulders would not be blamed so for rapping patterns too much, when the actual trouble is, too much shrinkage has been allowed in the pattern. Respectfully,

Indianapolis, Ind, OLD CHIP.

It is believed the quarrel between the Pennsylvania and Baltimore Railroads will result in the latter company building a short cut of their own between Baltimore and New York.



SCALE FOR CORE PRINTS.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE AMERICAN MACHINIST.

MACHINISTS' TOOLS—STEAM AND GAS ENGINES—BOILERS AND FURNACES—WOOD-WORKING MACHINERY—ENGINEERS' INSTRUMENTS—STEAM ENGINE AND BOILER APPLIANCES — SHAFTING — TURBINES — STEAM PUMPS — MILLING MACHINERY — DROP PRESSES—PIPE-CUTTING MACHINERY —TAPS, DIES, CHUCKS, FILES, JACKS, SMALL TOOLS, ETC.

J. A. Fay & Co., Cincinnati, Ohio, write us:

Our business for the past year has been better than ever before, and in fact rather more than we could desire. At the present moment, with our enormous facilities, we are from three to four months behind our orders, which come pouring in from all parts of the United States, Europe, South America, Australia, and occasionally India and Africa. We have at present about two hundred and twenty-five machine men in our works, and the casting department gives employment to about seventy-five more. We are making arrangements to immediately again enlarge the capacity of our works, which when completed will enable us to increase our force to about four hundred and fifty or five hundred men. The outlook for the coming season is very flattering.

The Akron Iron Co., Akron, Ohio, write us:

Our business in every department never promised so well as it does for 1881. The demand bids fair to be enormous, and the main question is, How are we to meet it?

This is especially so in our Hot Polished Shafting Department. The demand for this article is increasing very rapidly, taxing all our present capacity. Although we are in the dead of winter, when building is very difficult and expensive, we have been obliged, to meet the demand, to enlarge that part of our works. We are now building additional shop room, 130x40ft., which will be all completed by February 1, 1881. This will give us in all 270x40 ft. devoted to cutting off, straightening and storing shafting. This, with increased machinery for cutting and straightening, now on the way to us, together with one of Brush's 16-light electric machines, which we are now placing in position, will allow us to increase the output of shafting at least 100 per cent. We trust to be so situated as to be able to fill all orders promptly.

Buckeye Engine Co., Coal & Iron Exchange, New York, write us:

Orders more than plenty; prices sufficiently sufficient, with only the one drop of gall, that our customers *will* insist on having their engines yesterday! There is a great demand for heavy work, and we are now executing orders from the— H.P.

Pacific Mills, Lawrence, Mass.	1,200
Phila. Grain Elevator Co.	400
Ocean Mills, Newburyport, Mass.	600
Ponemah Mills, Taftsville, Conn.	300
American Wood Paper Co., Phila. Pa.	300
S. D. Warren & Co., Cumberland Mills, Maine	500
Lewiston Bleachery, Lewiston, Me.	300
Adelaide Silk Mills, Allentown, Pa.	300
Hurlbut Paper Co., South Lee, Mass.	250
American Linen Co., Fall River, Mass.	500
Arbuckle Bros., New York	400
Pacific Elevator, Brooklyn	1,200

And any quantity of smaller work to chink in with. Yet, still, like Oliver our cry is, "More," and this coming year, if nothing happens, will double our capacity.

The Pratt & Whitney Co., of Hartford, Conn., write us that though urging 560 men to the utmost, they find it impossible to accumulate an assortment of machine tools, and are now entering orders for lathes for delivery in April and May, 1881. To relieve the press of orders, they are erecting a building for a machine shop, 142 ft. long, 45 ft. wide, three stories high, which will give them one-half more floor area than they now use. Their business, for the past year, has exceeded six hundred thousand dollars.

Babcock & Wilcox, 30 Cortlandt Street, New York, write us:

We commence the year 1881, with over 10,000 H. P. of orders on our books, some 30 per cent. of the orders being from parties who have used our water-tube steam boilers for years. During 1880 we had to double our manufacturing facilities, and the outlook for 1881 is—that we shall have to double again.

The Brown & Sharpe Manufacturing Co., Providence, R. I., write us:

We are unusually busy in both tool department, machinery department and new foundry. Are now employing 350 hands. We have orders on the books from two to four months ahead. Business in machine tools is better than it ever before has been within our knowledge.

The Hancock Inspirator Company, 34 Beach street, Boston, write us:

Our prospect for business in 1881 is such, that although we have given orders, now unfilled, for $10,000 worth of new machinery, we are seriously considering the question of duplicating all these orders, and think we shall be obliged to do so. Orders for all classes of inspirators are pouring in upon us, although so near the end of the month and year. Our shipments this month will largely exceed those of any month in our history. We did hope to be able to clear our order book before the end of the year, but we shall be compelled to carry over orders for several hundred inspirators into the new year. We are having many inquiries for the "Scovell Pop Safety Valve," and propose to push this valve in 1881, making a special department for their manufacture. Although we have sold 16,000 inspirators in the past three years, we have but just commenced business, as we think we can show you in December, 1881.

Fitchburg Steam Engine Co., Fitchburg, Mass., write us:

Our anticipations of one year ago have been fulfilled, and we have been crowded with work for the past twelve months, part of the time employing seventy-five men, running twenty-four hours for four months, by using the electric light, to help us out of the tremendous pressure Our prices have been steadily advanced, but hardly in proportion to the rise in value of stock and labor. The adventitious "boom" is over, and things have settled down to solid business. Our prospects were never better, prices are held firm, and we are kept from six weeks to two months behind our orders, the latter running mostly to larger sizes of engines. We can also assure you that the year has in no degree abated our warm liking for and appreciation of your paper, which, like certain liquors, *improves with age.*

Delamater Iron Works (C. H. Delamater & Co.), foot of West 13th street, New York, write us:

The business outlook is better than it has been for the past seven years. We are full of work, and are at present working every tool in our works, giving employment to over 800 men. We feel assured of good and prosperous business in the immediate future.

Poole & Hunt, Baltimore, Md., (turbine water wheels, etc.), write us:

We are quite busy, employing more men than at any previous time, but are in condition to receive additional orders. We look for the continuance of a good time in the machine business, if the prices of materials and labor are kept within reasonable bounds.

Frank H. Clement, 122 Mill street, Rochester, N. Y., writes us:

My business of "specialties in wood tools" has never been better or had a better outlook than at present. Trade since August last has been very satisfactory, and although profits are sometimes microscopic, yet in the main they are as large as can be expected in an age of sharp competition and good work for low prices.

I am at present making tools for the production of my specialties, with a view to the doubling of my present floor room, soon after the first of the year, as I am at present crowded beyond endurance.

The Deane Steam Pump Company, Holyoke, Mass., write us:

Business with us is good and steadily increasing, having grown fully one-half beyond our expectations during the past year.

The Lane & Bodley Company, Cincinnati, Ohio, write us:

We find the demand good. Our sales have been double that of 1879, but prices remain low and competition strong, showing that the demand is not yet equal to the means of supply.

The Billings & Spencer Company, Hartford, Conn., write us:

Business is still booming with us; have just declared a quarterly dividend of 2%, payable June 1st, 1881. During the past year we have worked up into tools of our manufactures, and drop forgings for other manufacturers, one hundred-and-fifty tons of bar iron and steel. And judging from the experiences of the past four months, we shall work up two hundred tons in the next year.

Kearney & Foot, 78 Chambers street, New York, write us:

We have had a very large fall trade and still booming. Since May 1st we have nearly doubled our producing capacity, and now employ about 100 hands. We have about two months of unfilled orders for files on our books, and are increasing our works and working force as fast as is possible, consistent with maintaining a first-class quality of work. On our "Stubb" pattern files we are instructing our travelers not to offer the goods to new parties, as we cannot supply our regular trade, and it will be about six months before we shall have any more help educated to this class of work.

Geo. H. Barrus, 87 Milk street, Boston, writes us:

I am surrounded with indicator cards and data of recent tests, which are waiting their turn to be worked up, and I have several orders on hand for the future.

Bradley & Co., Syracuse, N.Y., write us:

The sales of our cushioned helve hammers have nearly doubled the sales of the previous year and promise an equal increase for the coming year. Our agricultural implement business is also growing rapidly, and we have every reason to believe that manufacturers may look forward to a year of unprecedented success in all kinds of business. The rise in the price of all kinds of raw material, used by manufacturers, is

simply a proof that the demand for the manufactured goods has increased, and indicates a healthier state of trade. We are, and have been for many months, behind our orders, although running full time and with an increased force of men.

Christiana Machine Co., Christiana, Pa., write us:

We have never before been so driven as during the year just closing; prices, however, have been low, and profits comparatively small. The coming year promises even greater activity than the past, and our orders, even now, in midwinter, are so numerous that we have no chance at all to stock up for the busier summer season, and we have great fears that our facilities will be entirely inadequate to meet the demand upon us, though they have been doubled within the past few months. The better class of skilled labor seems scarce and hard to get, and wages for such are on the increase. All things considered, we think the outlook for all departments of trade is most flattering.

E. Gould & Eberhardt, 97 to 113 New Jersey Railroad avenue, Newark, N.J., write us:

We have made over seventy-five of one class of tools the past year—many customers duplicating their orders, which shows that they are giving satisfaction. Our tools are made from entirely new patterns, and we put them on the market on their merits and let our customers judge them by their worth, as they are *now*, regardless of what some of them have been years ago.

We have had a prosperous year, and there is every prospect of a still better business in the year we are just entering upon. We doubled our sales last year, and confidently hope to do the same this year.

Philip S. Justice, 14 N. 5th street, Philadelphia, writes us:

Judging from our standpoint, the coming year bids fair to be one of great activity. Our country's finances, our crops, and the progressive spirit of our railroads, all point in that direction, and we are preparing to turn out more hammers, hydraulic jacks, etc., etc., than there has been occasion for since 1873. The past year we have been very busy, but expect to turn out much more the coming one.

J. M. Carpenter, Pawtucket, R. I., writes us:

I have increased my sales of taps and dies between 50 and 75 per cent. during the past year, and from present indications will have to increase about the same proportion before the close of 1881. There is no falling off in orders.

The New Haven Manufacturing Co., New Haven, Conn., write us:

Our business has been excellent during the whole of the last year, and the prospect for the new year in machine tools is very encouraging. We are doing all we can with our present facilities, and appearances indicate plenty of business for us.

The Hartford Steam Boiler Inspection and Insurance Company, Hartford, Conn., write us:

The steadily increasing business of the company must be accepted as evidence that its system of guaranteed steam boiler inspections meets the approval of the steam-using public.

Seeger Manufacturing Company, Springfield, Mass., write us:

We take pleasure in reporting an encouraging prospect for the coming season, our cast seamless jack screws, etc., having met with a very gratifying reception among the machinists' supply trade, railway men and others. We anticipate a large business from the numerous inquiries in regard to our goods and the number of samples sent to all parts of this country, England and Australia. Although a new thing, there is already evidence that practical men appreciate the merits of our cast screws as to strength, wearing qualities and cheapness.

We are just putting upon the market a new pattern of jack screw, known as the "Car Box Jack," with short screw ($7 \times 2\frac{1}{4}$ inch), bell-bottom and peculiarly shaped cap, which bids fair to be a great favorite with the railroads.

David W. Pond, Worcester, Mass., writes us:

Business prospects for 1881 are "solid;" good demand for machine tools, and general feeling of confidence.

The Albany Steam Trap Co., Albany, N. Y., write us:

Our sales have increased over 100 per cent. over last year; collections fair, prospects for the coming year good.

D. Saunders' Sons, Yonkers, N. Y., write us:

The prospects for business in our line of tools for the coming year are excellent. We are increasing our facilities to meet the demands of our customers for steam and gas-fitters' tools.

Schleicher, Schumm & Co., 3045 Chestnut street, Philadelphia, write us:

Our sales continue very satisfactory, and though the capacity of our shops has been considerably increased, we find no possibility to keep stock on hand, of our different sizes, to satisfy the demand of purchasers in immediate need of our "Otto" gas engines.

George B. Grant, Alden street, Boston, writes us:

My business is the making of gear wheels and the cutting of gears for other parties. Such work has generally been done by each machinist for himself; but I thought that the great expense of a proper fitting up, and the particular skill required for such work, made it a proper subject for a special business by itself, and the trade appear to agree with me to a considerable extent, keeping me busy all the time, with business increasing and prospects good.

Skinner & Wood, Erie, Pa., write us:

While it is a little early to make predictions, yet the tone of letters from our correspondents is most cheerful and assuring, leading us to look for a very busy season in 1881. This increased demand we are preparing to meet, and have just completed a new two-story machine shop, 150x45 feet, and a new shop for erecting boilers; with these and other increased facilities we can turn out between 300 and 400 portable engines during the coming year.

The past has been a year of wonderful advance with us. We are not so sanguine as to expect equal strides every season; dull years are sure to come again, and it is our endeavor to keep things so in hand that neither ourselves nor our men will suffer when they do. The coming three or four years, we believe, will be excellent business years; further than this we don't venture to predict.

Collections are now good, inquiries plentiful, and orders are coming in very freely. We believe the ruling prices in raw material warrant no change in our present prices of engines and boilers.

Betts Machine Company, Wilmington, Del., write us:

We are much busier now than we have been since the panic of 1873. The demand for machine tools is very great, and we are running night and day to keep up with our orders. Owing to this increased demand and to the upward tendency of labor and material, the price of our goods is steadily advancing, and we anticipate a decided movement in this direction before long. The activity in our gauge department is quite as great, and exceeds any thing we have ever experienced; the sales of standard gauges, measuring machines, and adjustable reamers for the past year, were more than three times those of any previous year, and the orders on our books at present indicate a still larger increase for 1881.

Our foundry is full to overflowing:—the demand from our own shop is so great, that we have had to refuse outside work; every available inch of floor space is in use, and although we have already made one addition in this direction, we contemplate a still larger one in the spring. Taken, all in all, we consider the present condition of trade very satisfactory, and the outlook for the future more than encouraging.

F. E. Reed, successor to A. F. Prentice & Co., Worcester, Mass., writes us:

Business with us is quite as good as one year ago, and our production of machine tools for several weeks ahead is already sold. The business outlook for 1881 we think very favorable.

Wm. Allen & Sons, Worcester, Mass., write us:

We have had an over-crowded season's work this fall, and there is as yet but slight abatement. Many inquiries, and some orders, if taken, are for delivery next April and May. It would look as if there will be no slacking up in the work this winter, and it is probable that all mills which are not fully equipped with steam power will put in engines and boilers, as soon as possible after the chance to run by water will allow. There seems to be no lack of business ahead.

Edward Wright & Co., Worcester, Mass., write us:

Business is all we could ask, with orders some months ahead. We have just completed a new shop, which we shall occupy in a few weeks, where, with increased facilities, we hope to be able to fill our orders more promptly.

Jarvis Furnace Co. (A. F. Upton, General Agent), 48 Congress street, Boston, write us:

We have had all the business the past year that we could attend to. We are now setting boilers in the largest mills in Lawrence, Lowell and Manchester, and have over 1,100 furnaces. Our prospect for the coming year is extremely good. Manufacturers are looking towards economy of fuel, and in New England some of the large mills are using fuel that costs less per ton than concerns in the same business in New York and Philadelphia are paying. We have made arrangements to have screenings brought direct from the mines, where 65 per cent. of all the coal mined is now wasted, and it is estimated that there are now 800,000,000 tons of waste coal lying at the mines. We have just commenced work in the West, and have orders from St. Louis, Chicago and Milwaukee, also large orders from the South. We are doing considerable work in Canada, and setting five boilers at St. John, N. B.

In engines, we sell the "Lawrence," and can sell all that the manufacturers can make.

F. W. Moss (steel and files), 80 John street, New York, writes us:

The year which has just closed has been the best we have had since the panic of 1873. Prospects for the year just opening are good, for a steady business on a sound basis with no great or violent fluctuation in values.

Wood & Drake, 71 Rutgers St., New York, write us:

Inquiries and orders for machinery have come to us from all sections of the country. Our orders for iron-working machinery have exceeded our ability to supply.

Present condition of business is good, and prospects, after January 1, better.

Beecher & Peck, 157 Temple St., New Haven, Conn., write us:

We are full of business. Orders are flowing in, so that we are obliged to run overtime. The outlook for the coming year is, indeed, very encouraging. The increased demand for the "Peck Drop Press" shows with what favor it is held by manufacturers.

Crosby Steam Gage and Valve Co., Boston, Mass., write us:

During the last two years we have doubled our capacity to manufacture our specialties, yet the present demand is so great that it is only a matter of a few months when we shall have to go through the same operation again. We have secured a renewal of all but one of our old contracts, with increased quantities, and have got as many more new ones for the ensuing season's supply. This is irrespective of our general orders for safety valves and steam gages. Orders for our other specialties are correspondingly large, and are constantly increasing.

W. C. Young & Co., Worcester, Mass., write us:

Our prospects for business the coming year are good, and we are way behind our orders for both machinists' and shoemakers' tools. Our engine and hand lathes sell faster than we can make them, and the shoe manufacturers seem anxious to outdo each other in the way of new styles and patterns, which keep us very busy.

Sweetland & Company, 126 Main street, New Haven, Conn., write us:

The prospect for the coming year is all that we could wish, having orders on hand at present writing for at least three months production. We shall increase our facilities this month by adding to our machinery a number of new lathes and planers; also special automatic machine for milling and gear cutting, which will, we trust, enable us to fill our orders promptly, and allow us to have at least one sample chuck on hand. Our customers want everything in a "hurry," and thus far we have been obliged to ship all chucks as soon as finished. Our prices will remain unchanged, being reasonable and at same time giving us a fair margin of profit.

United States Metallic Packing Company, 47 W. 38th street, New York, write us:

Present business and prospects for coming year are both excellent. Our shops are running to their full capacity, and now are about two hundred packings behind orders. Our agents in New York, Philadelphia, etc. report an increasing demand and interest in our packings; and during the past week we have had applications for manufacturers' license from three prominent engine builders, who propose to adopt the packings on their engines. Among the novelties of our recent manufacture is a packing for a pump plunger of 18 inches diameter for Lawrence, Mass., Water-works, which is giving entire satisfaction; also a packing for expansion joint of 15 inches diameter for Lawrence, Mass., Manufacturing Company. And during the past month we have furnished specifications and full working drawings for the London and Northwestern, and the London and Southwestern Railroads, the largest roads in England, and the packings will be generally adopted on those roads.

The Pope Manufacturing Company, 87 Summer street, Boston, write us:

We expect a very large demand for our bicycles next season.

The past two years the trade has been very brisk, and we have not been able to supply the demand. The newness of the bicycle has required an immense outlay for tools and machinery, as well as experienced hands; many of the parts necessary for their construction never having been made in this country, we were obliged to make a great many experiments. During the past two years we lost a large number of orders, which we might have taken, could we have supplied the demand; now we have everything in perfect working order, with a good stock on hand, and shall be able to fill orders promptly next season.

The E. Horton & Son Company, Windsor Locks, Conn., write us:

Our business is good and on the increase, with a prospect of remaining in the same condition. We are increasing our facilities by putting in new and improved tools, are having several machines built at present, designed particularly for chuck work; we are making a great many chucks for special work, and have secured the services, as foreman, of Mr. S. J. Kirk, who has been with The Pratt & Whitney Company for the last thirteen years, and who is a skillful mechanic; Mr. Slate, a well-known mechanic, is still our superintendent of the Mechanical Department.

Frasse & Co., 62 Chatham street, New York, write us:

Our business in machinist lathes, tools and supplies, etc., for the past year has been very good, and the prospects for the coming year look even better than the past. Prices seem to be tending upwards and desirable goods keep scarce.

A Large Hydraulic Pumping Engine.

A large hydraulic pumping engine, for draining the Chollar, Norcross and Savage shafts—the largest of the kind, it is represented, ever built, says the Boston *Commercial Bulletin*—has just been completed in San Francisco. The engine occupies a space 65 feet by 20 feet, and weighs between 200 and 300 tons, which the underground machinery will increase to about 1,000 tons in all. The engine accumulates water at 1,000 pounds pressure to the square inch, in a reservoir at the surface, sixty feet high, from which it will be conducted by a pipe 2,400 feet to the bottom of the shaft, there to operate a pump which will raise the sewage water 800 feet to the Sutro Tunnel, into which it will be discharged. The water which does the work returns to the surface by another pipe. The system can be extended to 3,000 feet in depth, or take water from mines half a mile away, simply by extending the pipes. The new system is intended to dispense with the heavy and cumbersome pump rods heretofore used.

A very powerful electric light of the Brush system was exhibited on November 29th at the London works of the Anglo-American Electric Light Company. The lamp, of the ordinary Brush type, carried carbons 1.25 inches in diameter, and the energy of the current was so strong that the carbons were raised to a white heat two inches from the arc. The current was generated by a 16-light machine. The photometric power of the light is said to be 47,000 standard candles.

The Colorado Pacific Railway Company have filed articles of incorporation in Colorado; headquarters, Pueblo, Col.

The Frankfort, Georgetown and Paris Railroad Company, have let a conditional contract for the construction of about 100 miles of its road from Frankfort, Ky., West to Paris, and thence into the coal region of Eastern Kentucky.

The Portage and Baraboo Railroad Company have filed articles of incorporation in Wisconsin to build a railroad from Portage to Baraboo, about 18 miles. The stock is to be $250,000, and the corporators are chiefly residents of Portage.

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☞ *Every correspondent in order to insure attention should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights or in selling machinery; nor have we any pet scheme to advance or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers inventors draughtsmen and all those specially interested in the occupations we represent on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JANUARY 22, 1881.

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The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

Brilliant Prospects for Manufacturers and Mechanics.

Elsewhere, in this issue, we present letters from a number of manufacturers of machinery, tools, and appurtenances, throughout the country, detailing the condition of business in each establishment, the substantial progress of the past year, and the prospects for 1881. It would seem that a perusal of these utterances, partaking, as they all do, of the strongest vein of gratification and confidence in the commercial situation, would act as a powerful tonic on the mental digestion of the most inveterate croaker; yet, undoubtedly, there are those who are trying to incite a widespread distrust of the future among manufacturers and others. But, while there are very many who are not able to withstand adversity, there are not a few who fail to sustain themselves creditably in prosperity. This peculiarity of temperament may be an excuse for an occasional alarmist.

Our advices agree that the outlook for this year, as well as present business, in machinery and its adjuncts, is better than at any other time since the panic of 1873. Some of them go further by declaring that the manufacturing and selling of machine-shop tools is more satisfactory than it ever has been before within their knowledge. We learn that one of the leading establishments in that line (from whom advices appear in this issue) have just advanced prices considerably, varying from twenty-five to forty per cent. This will, undoubtedly, be followed by advances by other houses.

With the largest manufactory of wood-working machinery in the world three or four months behind their orders, and obliged to immediately enlarge their works; with a large steam engine works declaring that "orders are more than plenty," and enumerating contracts for a dozen engines, the smallest being for 250 H.P.; with a steam boiler works having over 10,000 H.P. of orders on their books, after doubling their manufacturing facilities during 1880; with a machine-tool works urging 560 men to their utmost, and yet obliged to enter orders for lathes for delivery three and four months hence, and to erect a shop, giving them one-half more floor area as examples selected at random from the letters that appear this week upon our sixth and seventh pages, while the general tendency all around seems to be towards enlargement of producing capacity, we may well congratulate ourselves as moving upon a tidal wave of prosperity in mechanical industries. Just here we will call attention to another example mentioned in an article on "Locomotives of 1880," by W. Barnet Le Van, last week. The Baldwin Locomotive Works, employing nearly 3,000 men, have orders upon their books to keep them running at full capacity for *more than twelve months to come.* Scarcely three years ago the question of excess of capacity to build locomotives in this country, above the demand, was anxiously canvassed, and the conclusion reached that it would take many years for the demand to overtake the facilities for prompt supply. The change since then has been wonderful indeed, but when we consider the advanced position our country maintains in the excellence of her mechanical productions, we may be prepared for even a greater increase of orders from abroad than that which has aided so largely in bringing about the present unbounded activity and prosperity among our manufacturers and mechanics.

Reckless Running of Locomotives.

We clip the following extract from an exchange, which will give the reader a very fair idea of the careless locomotive engineers throughout the country, who hold the lives of hundreds of passengers at their fingers' ends:

A few days ago Hank Griffin, one of the most noted locomotive engineers in the country, was in Kansas City, and was interviewed by a reporter upon matters and things appertaining to his craft. He was just from Fort Wayne, Ind., and well acquainted with Fontaine, the inventor of the new swift locomotive, which will revolutionize travel by rail. Mr. Griffin, after explaining the plan of the engine, with which all are, by this time, familiar, said: "The entire weight of the engine is hung upon the upper drivers; the center of gravity, however, is in the same place as in other engines, and there is no increased danger from top-heaviness. The Fontaine engine can, in my opinion, on a straight, well-ballasted track, run 120 miles an hour without any trouble."

Mr. Griffin, in illustrating the speed, quoted several examples of fast running, by ordinary engines, which time could be easily doubled by the Fontaine engine. "For instance," he said, "I pulled into Crestline with a freight, and received orders to hook right on to a section of a passenger train, with instructions to put it through lively. My fires were low down, my engine dirty, and without an air brake, but I hooked on and pulled her open for all she was worth. I made my sixty miles an hour until the conductor got scared and slowed me down, when I lost ten minutes. He let the brakes loose, however, and I held my own until he got nervous again, and lost another ten minutes. He let go and I slid into Wayne, 132 miles, in 158 minutes. Taking off 20 minutes lost, and I came pretty near pounding her over the back at a mile a minute, with a dirty engine, a green fireman and no air brake."

Hank is a man of great nerve, and is known for his headlong driving. He is nicknamed, "Old hundred feet and plug her," because he will run up at full speed to within a hundred feet of his stopping point, and then throw her over and plug her.

The statement in regard to the center of gravity of the engine in question is certainly erroneous, as the weight of the valve motion, which is usually placed under the boiler, in this case is placed on top as well as an extra pair of drawing wheels. The cylinders are raised well up on the sides of the smoke arch, and we would like to see a demonstration determining the actual location of the center of gravity in this engine. In our opinion it is certainly much more top heavy than the ordinary class of engines. Mr. Griffin appears to be like many other locomotive engineers, who are infatuated by every new contrivance and use their utmost endeavors to get such devices applied to their engines.

This class of men is generally the most difficult that master mechanics and inventors have to deal with in trying experiments, and will generally cry out in condemning the appliances before there has been a sufficient test made to establish or condemn the invention. Men of this stamp are always breaking some part of their engine because they "pull her out for all she is worth." They do not seem to realize what the strength of an engine is, or have a true conception of the power that drives it. We have known such men who possessed and were proud of the reckless qualities here mentioned.

There are still plenty of locomotive engineers who will run up to within one hundred feet of a station, then "throw her over and plug her," which practically means that, in reversing the engine, the sharp cinders and dirt from the smoke stack is drawn into the cylinders through the exhaust ports, cutting the valve seats and cylinders.

This is not all, for when reversed the engines act as air pumps, forcing air into the boiler, which will cause an old or weak boiler to leak badly. We remember several cases where the throttle valves were of the balanced poppet style, and being held fast by a thumb screw when the engines were reversed the pressure in the cylinders became so great that in one case the steam chest was burst into flinders, while in another the cylinder heads were blown off.

We also remember one of the class of men referred to who started out on the road and cursed his pump because it would not work, and when it was suggested to him that there could be no water in the tank he laughed at the idea. Inspection brought out the facts that the engineer had relied upon the fireman to fill the tank, and the latter had forgotten to do it, in consequence of which the engine was out upon the road, ten miles from a station, with no water in the tank and a very small supply in the boiler. We are glad to know that the locomotive engineers are working out of these reckless ways, and hope that the time will soon come when reckless runners will be obsolete.

The last issue of the AMERICAN MACHINIST, January 15th, was the 100th number published since its commencement in November, 1877. Our readers will agree with us that our progress has not been slow during the time of these 100 issues. We hope and expect to make as much progress while getting out 100 numbers more.

Good machinists, moulders, tool makers, etc., can find several openings for situations by perusing the pages of this issue.

William A. Lighthall.

It becomes our painful duty this week to record the death of another of our pioneer and eminent engineers, William A. Lighthall, who was extensively known throughout the country, particularly among marine engineers, as the inventor, among other things, of the surface condenser. He was frequently known by the title of "The father of the surface condenser." Mr. Lighthall died of pneumonia at his residence in Brooklyn, January 4, 1881, after a brief illness. We intend to publish an extended account of his eventful life and labors in our next issue.

The types last week, by omission of the single word "light," in our editorial entitled "Winter Economies," made us appear to advocate the expedience of going about without any clothing at all in winter—rather a bold suggestion, to say the least, at this time. Similarly our note in the issue of January 8, regarding certain locomotives recently shipped to Brazil by an American firm, places the number of flues at 120, instead of 170, the correct number. For the information concerning these locomotives, we were indebted to the eminent engineer, J. C. Hoadley, of Boston.

Literary Notes.

EXTRACTS FROM CHORDAL'S LETTERS.—Comprising the choicest selections from the series of articles entitled "Extracts from Chordal's Letters," which have been appearing for the past two years in the columns of the AMERICAN MACHINIST. With steel portrait of the author; also original illustrations by Charles J. Taylor. $1.50. AMERICAN MACHINIST PUBLISHING COMPANY, New York.

In formally calling attention to the distinguishing features of this book in our columns, we will simply quote an extract from the preface (which is written and signed by the author, with his real name and address) and a few extracts from reviews in well-known newspapers. In this issue we have room for only a few clippings from notices which have appeared in the daily press, and shall present others from technical and other journals hereafter.

EXTRACT FROM PREFACE.

There is plenty of shop in these letters—good shop and bad shop; in fact, they are shop letters written for shop men, by a shop man, who has as much interest in the people who go into the shops as in the marvelous products which come out of the shops.

As if there were not enough of the mechanic in these letters, it seems a pity to miss the chance in a preface to express the view that we live in a peculiar land, under a peculiar form of government, surrounded by peculiar social conditions.

In other lands the well being of all depends on the wisdom of the few who rule. In our land, the well being of all depends on the wisdom of the mass who select their rulers. In other lands, the ignorance of the mass will insure the stability of the existing civic form.

In our land, the ignorance of the mass will insure the total destruction of the existing civic form.

The shop men form a large proportion of our civic mass—They must be more than workmen; they must be citizens. They must have more than skill; they must have education. Education and wise citizenship cost money. The mechanic of the republic must be better paid than the mechanic of the monarchy.

Our mechanics are wiser citizens than the mechanics of any other land, and they are better paid than in other lands.

FROM REVIEWS IN THE DAILY PRESS.

Chordal is one of the few men that have the faculty of writing directly for and at mechanics and artisans.—*New York Herald.*

The choicest parts of a series of letters to the AMERICAN MACHINIST are put together without much effort at sequence. They will interest artisans greatly, and give to others insight into the lives of the thousands who pass the greater part of their time in workshops. Indirectly, much light is cast on the inner working of trades unions.—*New York Times.*

There is some humor and a great deal of useful suggestion in the "Extracts." The purpose of the book is to induce machinists to read more in their spare hours.—*New York Tribune.*

This little volume is worthy of being put on the library shelf beside the volumes of Samuel Smiles. The writer is practical, and without any pretension to humor or eloquence, has a graphic and stimulating style of his own, the effect of which is heightened by the odd illustrations.—*New York World.*

This series of letters forms one of the most readable and common-sense books on methods of doing business, the peculiarities of master machinists, foremen, workmen, and others connected with the business. His style is terse, blunt and yet clear and concise. You never mistake his meaning or have to read over the same sentence twice to see what he is driving at. Every machinist—indeed every mechanic for that matter—should have this book, and once he possesses it there is no danger but he will read it. It is a compendium of the wisdom of experience, of acute observation, of sound practical ideas upon matters which are of the first interest to manufacturers and mechanics everywhere.—*Boston Herald.*

These letters were written by a practical machinist, who is also a bright entertaining writer, and treats of a great variety of subjects of interest to mechanics in all branches of work. The book is, besides, full of useful hints about shop work, and gives character sketches that every workman will recognize. The book deserves to have a large sale. —*Philadelphia Ledger.*

We say boldly that there has not been a publication in fifty years that is capable of doing so much good among mechanics, in every shop in the land, as this one. Even the amateur mechanic can understand its entire language and profit by it.—*Syracuse Sunday Times.*

The letters are written by a practical mechanic and are full of practical information. They are characterized by shrewd common sense and by a certain rugged manliness which commands respect. A copy of this book should be in the hands of every artisan in the country.—*Philadelphia North American.*

The book is well printed and contains a good many illustrations. The apt and telling illustrations in the body of the letters, however, are its attractions. If a multitude of mechanics and laborers would read these letters, and put in practice their teachings, they would be benefited—*Chicago Inter Ocean.*

Racy in style, full of common-sense suggestions and arguments, often conveyed by incidents in the career of the author and of others, they teach lessons which, if heeded, would prevent many a life from becoming a failure, and would ensure mutual self respect and consequent harmony between employer and employed.—*Cincinnati Gazette.*

They describe in a lively way the different classes of workmen engaged in machine shops, the different classes of shops in which they work, and the varied character of employers. They indicate what can be accomplished by skilled workmen and good tools always handy, and by a methodical arrangement of the work to be done, and with this is contrasted the slipshod method of doing things. The letters are very clearly written, and are evidently based on facts that have come under the observation of the writer. His character sketches are also remarkably good, and are evidently drawn from life.—*Baltimore Sun.*

The selections contain valuable hints for both the manufacturer and the mechanic, and are made interesting by appearing in a narrative form.—*Pittsburgh Leader.*

Chordal is a machinist who writes of the shop, and would have his fellow artisans intelligent on all subjects that concern their interests, both as workmen and citizens —*Buffalo Courier.*

At first glance this would seem to be a very dry and uninteresting subject on which to write a series of articles, but Chordal has so managed the topics and is such a thorough master of every detail of the business, that he makes every article intensely interesting. No machinist, dealer in machinery or interested in a business where machinery is used should fail to have a copy, as there is not an article in the book from which some new hint may not be learned.—*Poughkeepsie Eagle.*

A very useful and interesting book to machinists and other workingmen, as well as to the general reader.—*Springfield (Ohio) Republic.*

While treating exclusively upon mechanical topics, the subjects are so plainly set forth and discussed as to be readily understood by the average intelligent reader. The book would prove of value to every mechanic, and an appropriate acquisition to any library.—*The Lynn Bee.*

They were written because the writer was in the mood for saying something just then in his mind. They are like sparks from the anvil struck off blow by blow, not because he wanted to see the sparks, but because he wanted to shape his thoughts into something useful. As a specimen of what a wide-awake American mechanic is thinking about, while hands and eyes are busy at his craft, this book is useful and suggestive.—*New Haven Palladium.*

The volume is well gotten up and nicely illustrated. The book discusses the problems which come up between employer and employe in a manner at once new and striking, and so fraught with good sense that the discussions are valuable alike to all who have to do with these matters personally, or are interested in them theoretically. *Bridgeport Standard.*

These letters show ability of a most uncommon kind. Some letters contain suggestions of difficulties and predicaments, in which the most ingenious mechanics as well as other men will at times find themselves, and we experience a relief equal to that of a hardened novel reader at the unexpected denouement of a complicated plot, as we note the pithy suggestions for getting out of such fixes; in others the keen insight into character and the graphic power of description of the author, as he grasps and delineates some well remembered variety of character or idiosyncracy, which none fail to recognize.—*Jersey City Evening Journal.*

They bear evidence on their face of being written by a hand which handles other tools than the pen. It is a volume which every mechanic would profit by reading. There is not a morbid sentimental sentence in it; there is not even enough method in it to justify us in calling it an argument; yet the absence of both elements does not detract at all from our hope that, as Chordal continues to send his letters to the AMERICAN MACHINIST nearly every week, we may greet still another bound collection of extracts in due season.—*Syracuse Evening Herald.*

The *National Labor Tribune*, of Pittsburgh, Pa., comes out January 1 in a new dress, enlarged to eight pages. In character of contents and general make up, it is the best labor journal we have ever had the opportunity of perusing. It is published every Saturday, at $2 a year.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) C. M. D., Golden, Col., asks: Can 22 teeth be cut in a gear blank, using a milling machine having an index plate, upon which the holes are indexed as follows: 22—24—30—36—42—48? *A.*—Yes, but not using the holes, for the reason that 22 is not a multiple or an exact divisor of any of the numbers. A short way out of the difficulty (particularly if you have only a few wheels to cut) is to divide the outside edge of the index plate into 22 equal parts. This should be done with a pair of stout dividers which are not liable to spring, the points being carefully sharpened. After the divisions have been accurately made, the end of each line should be marked with a very fine center punch mark. A steel-pointed gauge may now be clamped at any convenient place, so that the point may be brought to coincide with the marks upon the index plate without touching, care being observed to secure the gauge so that it cannot move. By moving and securing the plate successively, so that the gauge coincides with each mark, the gear may be easily and accurately cut. By following these directions many other gears may be cut, requiring a number of teeth not designated by the holes in the index plate.

(2) H. L., New York, asks: Do you think that a tube of 4″ diameter can be lengthened 6″ by welding a piece to the end, and will it be as strong in the weld as any other part of the tube provided it is properly done? *A.*—Yes, but it should be welded by a man who is accustomed to welding pipe, otherwise it will not be as strong.

(3) E. F. Waynesboro, Pa., asks: What kind of grates are the best suited for burning saw dust? I cannot find any thing in any works that I have in reference to this matter. *A.*—We have known excellent results obtained by using grate bars, made for ordinary furnaces, of flat plates of a width of about 6″ and running lengthwise of the furnace. Each of these plates has two ribs of a depth of about 4″ by ½″ thick, for supporting and preventing the plates from warping. The plates are perforated by holes 3-8″ to 7-16″ in diameter, which are largest at the bottom to facilitate moulding and prevent the holes from stopping up. This style of grate has also been used for years upon locomotives for burning soft coal, and is adapted to burning coal dust, coke and other miscellaneous fuels.

(4) G. A., Cambridgeport, Mass., writes: The answer given in your issue of Oct. 16, to my question in regard to diameter of gear wheels was not quite satisfactory. The question was, perhaps, not properly stated. I have a pinion 41-100 inch *outside* diameter having 18 teeth. I wish to find the diameter of a blank for a wheel to fit this, to have 101 teeth. The teeth to project beyond the pitch circle a distance equal to the diametral pitch. My method is this

$$.41+(18+2)=.0205$$
$$.0205\times(101+2)=2.1115=$$

required diameter of blank. Am I right? *A.*—Yes. You will find the example worked out correctly in the AMERICAN MACHINIST for Nov. 6, 1880 on page 6.

(5) G. A. B., Yonkers, N. Y., writes: I wish you would tell me how to find the horse-power of a boiler and engine. *A.*—To get the horse-power of a steam engine multiply the area of the piston by twice the length of the stroke in inches, times the number of revolutions per minute, times the mean effective pressure of steam in the cylinder in pounds, and divide the product by 33,000 which will give the horse power required. To get the actual mean effective steam pressure in the cylinder apply an indicator and take some diagrams. The horse power of a boiler is an indefinite expression, as a so-called boiler of 40 horse power may be able, with good setting, good fuel and the most favorable circumstances to develop 80 horse-power, while under adverse circumstances may not develop more than 20 horse power. Give us some data and we may help you.

BUSINESS SPECIALS.

50 cts. a line for each insertion under this head.

American Watch Tool Co., Waltham, Mass., Whitcomb Watch Makers' Lathes, and Watch Machinery.

Thomas D. Stetson, Patent Solicitor and Expert in Patent Cases, No. 23 Murray Street, New York.

See Christiana Machine Co.'s adver., on page 14.

James W. See, Designing and Consulting Engineer, Hamilton, Ohio.

J. C. Hoadley, Engineer and Expert, formerly of Lawrence, Mass., has opened an office at 29 High St., cor. Federal, Boston, Mass., where he will be pleased to receive old and new friends.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, the author, Manchester, N. H.

Bicycle repairs, spider wheels, frames, bells, stands &c. T. B. Jeffery, 253 Canal Street, Chicago.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

"Monitor Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. American Machinist Publishing Co., 96 Fulton St., New York.

MANUFACTURES.

James D. Foot, 78 Chambers street, New York, formerly interested in the manufacture of small machinists' tools, has sold out his interest to C. L. Bellamy (the originator of these tools), his file business having become so extended as to force him to give up all outside lines of manufacture.

E. D. Fellows, jeweler, Berlin, N. Y., intends to add model making to his business and fit up with tools for that purpose.

David W. Pond has recently contracted with the Hartford Engineering Co., which is to manufacture the Buckeye engine, to refit the shops formerly occupied by the Woodruff & Beach Engine Co., Hartford, with new machinery. This is believed to be the largest order for iron tools ever placed in this city. Mr. Pond's facilities are such that this contract will not interfere with the regular productions of his shop, which is run day and night.—*Worcester Spy.*

The Rockford Electric Light and Power Company, Rockford, Illinois, is a new company recently incorporated. The officers are John Barnes, President; John H. Sherratt, Vice President; James H. Blodgett, Secretary; Hosmer P. Holland, Treasurer. The president is of the well-known machinery firm of W. F. & John Barnes, Rockford, Illinois.

R. M. Wanser, of Hamilton, Ont., is about starting a screw factory.

A cotton manufactory is to be started in Hamilton, Ont., immediately, which will give employment to 250 hands.

All the stock of the new cotton mill at Montreal, $300,000, has been subscribed. Arrangements are being made with the municipality of St. Henri, in the suburbs of Montreal, where the mill will be located, for tax exemption and a bonus of 15 per cent. on the capital.

D. Saunders' Sons, Yonkers, N.Y., have just shipped A. M. Byers & Co., Pittsburgh, two No. 4 pipe cutting and threading machines for their new mill.

George Ehret, the brewer, has several Korting Improved Steam Blowers, to produce better combustion in boiler furnaces, and consume cheap fuel advantageously, furnished by A. Aller, 109 Liberty St., New York.

The Union Ferry Co., New York, are placing several Korting Universal Injectors on their boilers.

C. C. Newton, formerly of Cleveland, O., has leased, and is now fitting up, a convenient shop at 2341 and 2343 Callowhill St., Philadelphia, where he will engage in the manufacture of milling machines and drill presses as a leading specialty.

The farmers in the vicinity of Springfield, Mass., talk of starting a butter factory, to make the real genuine article from milk and cream. It takes ten quarts of milk to make a pound of butter. We are glad to note that the oleomargarine factories are to have opposition.

Capital to the amount of $75,000 has been pledged to start a beet sugar factory at Schenectady, N. Y.

The yards along the Hudson River made more brick than ever before last summer, probably exceeding 1,000,000,000.

A prominent citizen of Thomasville, Ga., states that he is ready to put $5,000 in a cotton factory, if other parties will subscribe $10,000.

A cotton factory at East Waco, Texas, has shut down on account of the present high prices of cotton. As soon as cotton declines operations will be resumed.

The Westinghouse Air-Brake Company, whose works are now situated in Pittsburgh, have secured the Anchor Cotton Works at Allegheny City. The present works of the company in Pittsburgh are to be occupied by a new company about to be organized, and to be known as the Westinghouse Machine Company, and to be devoted to the manufacture of patented specialties.

The Dennison patent fire-engine is to be manufactured in Reading, Pa. A building has already been secured, and it is proposed to give employment to 100 men. This engine was formerly made in Newark, N. J.

Newly Incorporated Penna. Companies.

The Baltimore, Pittsburg and Chicago Railroad Company, Pittsburg; W. E. Schwertz, J. H. McCreery and others, incorporators. Capital stock $800,000, in shares of $50 each. For construction of a railroad from Pittsburg to a point at or near Acor, on the boundary line between Pennsylvania and Ohio. January 3d, 1881.

The Lilly & Sons Manufacturing Company, Chester; John Lilly, John Lilly, Jr., and others, incorporators. Capital stock, $45,000, in shares of $100 each. For the manufacture and sale of cotton and woolen goods, and the manufacture and sale of warps. January 3d, 1881.

Union Mills Paper Manufacturing Company, New Hope; Ferdinand W. Roebling, Benjamin F. Lee, and others, incorporators. Capital stock $40,150, in shares of $50 each. For the manufacture of paper and paper pulp. January 3d, 1881.

The Transverse Passenger Railway Company, Pittsburgh; Joshua Rhodes, Wilson McCandless, and others, incorporators. Capital stock $100,000, in shares of $50 each. For the construction of passenger railway in the city of Pittsburgh. January 4th, 1881.

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 6, 1881.

Dealers are still engaged in taking stock, and few changes in prices are announced, but the general tendency in supplies and tools is upward. Desirable goods in many lines are still hard to obtain.

There is a boom ahead in prices of Machine Tools, nearly all the manufacturers claiming that an advance is imminent. The Pratt & Whitney Co. have already led the way with a considerable advance.

Copper Rivets and Burs have advanced from 35 per cent. to 33⅓ per cent. discount, taking effect January 1st.

Wire Rope has been reduced about 10 per cent. Cordage has been sharply advanced. Foot power Engine Lathes, all sizes, have been advanced about 10 per cent.

Leather Belting Manufacturers are considering the question of an advance, but nothing can be predicted. Efforts are also making to advance the price of crude rubber. No combination now exists in rubber goods, and every man makes his own prices.

It is thought brass goods bid fair to advance soon. Iron pipe and steam fittings firm with a slight advance anticipated. Coe's wrenches have declined 5 per cent. within the week.

Carmichael & Emmens, Boiler Makers Supplies, 130 to 134 Cedar St., New York, have admitted Wm. P. Worth, of Coatesville, Pa., to their firm, and the firm name is now Carmichael, Emmens & Worth.

The Dixon Crucible Co., Jersey City, N. J., have suspended with liabilities reported to be about a million dollars. The Company is in the hands of a receiver and business will go on as usual. We trust the suspension will be only temporary.

Iron and Metal Review.

NEW YORK, January 6, 1881.

Pig iron is very quiet but considerable business is being done in a regular way. No. 1 Foundry, $25; No. 2, $21½ to $22 and Grey Forge, $20. There is but little doing in Scotch pig. Eglinton $21½ to $22. Gleagarnock, $22½ to $23; Gartscherrie, $23 and Coltness, $24. Old T rails are strong at $27 and No. 1 Wrought Scrap at $23. Manufactured iron is unchanged in price. Boiler tubes are firm at last quotation with a prospect of advancing.

LUCIUS HART & CO., 8 & 10 Burling Slip, New York, furnish us the following to-day:

The metal market is feverish at commencement of the year. Dealers unwilling to name prices. Buyers anxious. Pig Tin, in London, £94, Singapore $28⅛. We quote Spot market nominally. Banca Tin, 24¾c.; Malacca and Straits 20¾c. to 21c.; Australian and Billiton 20½c.; "Lamb & Flag," 20¼c. to 20½c.; Bar Tin, 22c.; Pig Lead 4½c. and upwards; deliveries very uncertain, navigation being blocked. Antimony, 15½c. to 16c. for Cookson, other brands 15c.; Spelter higher, advanced in Europe equal to £1, 15s. per ton. American 5½c.; "Bertha," pure, 8¼c.; Solder, No. 1, 11c.; "Half and Half," 13c.; Bismuth, $2.50 and upwards.

WANTED

Wanted.—Machinists and tool makers wanted by the Brown & Sharpe Mfg. Co., Providence, R. I.

Wanted.—Foreman for Boiler Shop. Must be a first-class mechanic, and competent to take full charge of Boiler Shop—make drawings and estimates on Boiler work. Of temperate and steady habits. To the right party the situation will be permanent. Address Griffith & Wedge, Manufacturers of Engines and Boilers, Zanesville, O.

Wanted.—Engagement by Mechanical Engineer. First Class Draughtsman. Reference from Leading English Firms. W. H. W., Windsor Hotel, Jersey City, N. J.

Wanted.—An experienced Machine Tool Draughtsman with prospect of permanent situation at good wages. Address, stating experience, salary desired, &c., "Tool Shop" care AMERICAN MACHINIST.

Wanted.—A deserving and able young draughtsman wishes a permanent engagement. Best references furnished from previous employers. Address Bones, office AMERICAN MACHINIST, 96 Fulton St., New York.

Wanted.—Experienced machinist skilled in scraping. Also a live pattern maker. Nordyke & Marmon Co., Indianapolis, Ind., builders improved Mill machinery, Portable Grinding mills, &c.

Wanted by the Southwark Foundry and Machine Co., Philadelphia, a number of first-class Fitters on Engine Work.

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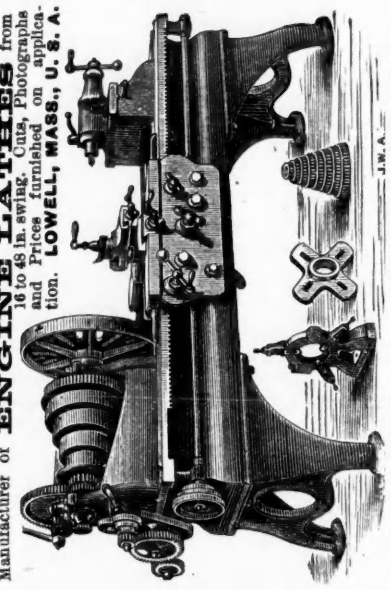

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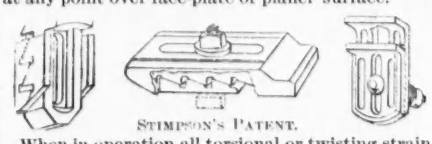
STEEL CHUCK-JAWS AND BOLT-DRIVER.

This device for holding work firmly on machinists' lathe and planing machine is not limited to fixed distances. The Jaws can be conveniently adjusted at any point over face-plate or planer surface.



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When in operation all torsional or twisting strain is obviated, the force applied to close the jaws being directed in planes that pass through and on both sides of the point of resistance. The jaws will fit any face-plate or planer, combining utility, economy and simplicity. J. H. STIMPSON, P. O. Box 2014. Philadelphia, Pa.

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With Suitable tools for finishing and repairing. Use steam power. Is in good locality. Address
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True to pattern, sound and solid, superior in strength, toughness and durability to iron forgings, in any position, or for any service whatever. Gearing of all kinds, Shoes, Dies, Hammerheads, Pistonheads, for Locomotives. Railroad and Machinery Castings of every description. 15,000 Crank Shafts and 10,000 Gear wheels of the Steel now running prove its superiority over other Steel Castings. CRANK SHAFTS AND GEARING SPECIALTIES. Circulars and Price Lists free. Address
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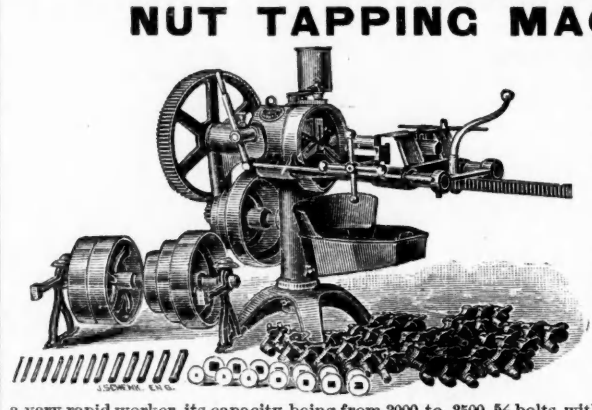

OUR NEW REVOLVING-DIE MACHINE is now recognized by practical machinists to be the perfection of a Screw Cutting Machine, and we now challenge the world to produce its equal. It possesses many advantages over any competitor. The dies are opened automatically when the desired length of thread has been cut on the bolt, and are closed by the lever, or automatically, as shown in the cut of the machine. It can be changed from one size to another in less than a minute without removing a bolt or pin. It does not require skilled labor, but can be operated by any competent boy. The dies are arranged to open and close automatically, therefore do not require the constant attention of the operator. It is a very rapid worker, its capacity being from 3000 to 3500 ⅝ bolts with 1½ inches of thread per day—and larger bolts in proportion. Threads cut by these machines will not vary ½ thread in length on ten thousand bolts. The machines are simple in construction, very compact and strongly built, and are offered much below the price of any other machines capable of cutting the same sizes, and amount of work. It is adapted to cut right and left hand, V thread, square threads, and coach screws,—will take in crooked as well as straight work, and cut any length of bolt. The machines are now largely in use, and we offer them to the trade as one of the most complete machinists' tools in the market. Every machine is warranted as recommended.

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THE SINGER MANUFACTURING CO.
Messrs. KEARNEY & FOOT, Elizabethport, N. J., July 9th, 1877.
Dear Sirs:—We have for the past ten years used the Files of your manufacture, and during that time we have never had any fault to find with them. We can safely affirm that for evenness of temper, sharpness of cut, accuracy of shape and all other qualities which go to make up a perfect File, they are equal, and in some respects superior, to the best English-made Files. Very Truly, WM. H. INSLEE, Contractor.

Messrs. KEARNEY & FOOT, Elizabethport, N. J., May 3rd, 1877.
Gentlemen:—We have been using your Files, both new and re-cut, for several years, and take pleasure in saying that we have found them a very superior article.
HANS REISE, Contractor, with The Singer M'f'g Co.

We print instructions on the use of Files, and also give the diameters of round and square Files from 3 to 16 inches. They are on card board, 10x12 in., and are intended to be put up in the shop for the men to read. We are pleased to mail them to any manufacturer on receipt of the necessary 6 cents postage.
Respectfully, KEARNEY & FOOT.

MAHONY CORRUGATED GRATE BAR.
For Steam Boilers & Furnaces.

Free Circulation with 50 per cent. Air Space. Openings suitable for Furnace Coal, Screenings, and all kinds of Waste Fuel. Used by the principal manufacturers throughout New England and the West.
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Can be made with skeleton or flat planed bed-plates; round or hinged square table, with or without double gearing and power feed, as may be desired.
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